The

Electrical Review

VOL. CII. MARCH 9, 1928. No. 2,624.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE M.I.E.E., A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

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Telegraphic Address "AGEEKAY, CENT., LONDON," Code, A B C. Telephone No.: Central 7072 (Three Lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

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Electricity in the Service of Man.

THE crowded attendance at the Institution of Electrical Engineers last week, when Dr. S. Z. de Ferranti, F.R.S., past-president of the Institution, delivered the Faraday Lecture, bore witness to the conviction of the members that the lecture would be interesting, as well as to their affection for the lecturer, who is probably the most popular electrical personality in these isles. The lecture was delivered in conversational style, without the aid of a single note, and dealt with a subject of universal appeal, the title being that used years ago by the late Dr. Mullineux Walmsley, for a work which played a great part in developing the idea that electricity was, above all things, the servant of the public. It is true that most of the matters touched upon have been referred to more than once by Dr. Ferranti and others during recent years, but on this occasion they were marshalled in masterly fashion and set forth with a flowing eloquence which held the audience as under a spell. As Dr. Ferranti pointed out, he had already delivered the lecture at five Centres of the Institution, and it was, like all the Faraday Lectures, of a "popular" nature; but that was in no sense a drawback—it is good for the technical man now and then to step aside from his specialised position, and to survey the electrical landscape from a less restricted point of view. As Mr. F. Gill feelingly declared, amid laughter, in moving a vote of thanks, his conscience had been touched: the men ought to take thought of what they could do for the womenkind by introducing electrical labour-saving devices in the home.

And that suggests to us that much of the lecture was directed towards "Electricity in the Service of Women"; "man," no doubt, includes the female sex in the general sense, but not in the specific, and it is the woman who counts in the household. The fact that the women have got together in their own interests and formed an Association to promote the use of electricity in the home reflects, in a measure, upon the attitude of the men who knew what electricity could do for them, but failed to see that it was done. That the Electrical Association for Women, during the few years that it has existed, has already enrolled no fewer than 2,000

members is a fact of great significance, and it is so actively extending its organisation in the provinces that its membership is likely to attain far greater dimensions in the near future. This is a very hopeful and satisfactory feature of the position, and gives support to Dr. Ferranti's prophecy that ultimately, the consumption of electricity in the home will far exceed the requirements of industry.

In the meantime there is a vast amount of educational work to be done. As Dr. Ferranti remarked, the electrical industry has not yet developed the selling side of its activities; it is gradually awakening to the fact that to generate electricity and place it at the disposal of the public is only one of its functions—the distribution of energy is equally important, and must not merely be permitted to grow but must be fostered and accelerated by every proper means at our command. The Electricity Act of 1926 provided for generation, but Sir Andrew Duncan, chairman of the Central Electricity Board, recently appealed to supply engineers to develop the market for the consumption of the Board's commodity. The British Electrical Development Association is doing its best, and deserves the warm and practical support of every branch of the industry; the Electrical Association for Women is growing in importance and efficiency; and we have over 600 centres of distribution, besides thousands of electrical contractors—surely if we all "push the sale of electricity" together we can double the speed with which the electrical idea is propagated, and teach the public, as Dr. Ferranti says, that they *require* electricity!

The Fair.

The British Industries Fair of 1928 closed its doors a week ago, but its influence will remain for some time to come. We are now as a journal beginning to see the fulfilment of the prophecy that we made between two and three years ago when be brought the urgency of the Birmingham Section to the notice of the whole electrical trade. We believe that the trade fully recognises the part that we played on that occasion, and we need not say that it is with unmeasured delight that we know that the Castle Bromwich electrical efforts of 1926, 1927, and 1928 have established the fact that this brief annual electrical trade display and market has come not only to stay, but to grow from year to year. In the first of those three years things had to be hurried owing to the lateness of organised action, the second showed great improvements, and this year, the third, has made remarkable advance upon both of its predecessors. Yet, it is beyond question that we have learned a good deal this year which will enable us to do still better in 1929. If we may say so, the result of the 1928 operations has disposed of the cynical suggestions of those who did not favour the idea of electrical co-operation in such an exhibition. Little men who scoffed in 1926 have come in 1928 to offer praise in almost fulsome terms. Herein we find some measure of justification for our early advocacy and a greater guarantee of an entirely unanimous electrical Press in support of the Fair of 1929. We have heard and seen all sorts of statements regarding the amount of business done in the Electrical Section, but we are not dependent upon these for our conviction that success was most gratifying. We hear little comment now, as was once the case, of the suitability or otherwise of Birmingham as the centre. We hope that those who preferred London or Manchester will be impressed by the success of Birmingham in these three years, and will early resolve to be in their appropriate place a year hence. Furthermore, we believe that such success as has been recorded there in February and March, 1928, will go a long way to satisfy exhibitors that at this time of the year there is substantial opportunity for both home and export trade to be done on a substantial scale, while the get-together spirit of manufacturing exhibitors, trade buyers, foreign visitors, and electrical association tours, is a good thing for all of us whenever it can be arranged. The Fair gatherings have been something quite different from the organised summer events of the associations and the regular gatherings of electrical institutions or associations. We hope that the Electrical Advisory Committee will proceed without delay to make its plans for next year's Fair. There may be some helpful suggestions to advance for better organisation, and early settlement of these points, and the early canvass of the whole manufacturing industry, should enable us next year to have a bigger and more satisfactory show than ever. We must not allow the work to fall too heavily on a few shoulders, and we ought to see whether we cannot do something more substantial either independently or by way of co-operation with the Department of Overseas Trade in bringing foreign visitors to these shores while the Fair is in session. Some alteration of arrangements may be found possible for enabling the public to inspect these great displays of British manufactures without causing so much displeasure to exhibitors themselves.

The Glasgow Blunder.

The situation at Glasgow has developed in an unexpected direction: the general manager, Mr. R. B. Mitchell, has accepted the decision of the Corporation and handed in his resignation, which came before the Town Council at its meeting on Thursday last week. It is true that Mr. Mitchell makes certain reservations, but they are rather in the nature of suggestions than conditions, and whilst he renews his protest against the unjust treatment that he has received, he leaves himself in the hands of the Corporation.

Naturally, we have no comment to make on Mr. Mitchell's decision: he is the best judge of his position and prospects, and is of course more fully conversant with local circumstances than any outsider can claim to be. But we emphatically adhere to our contention that he has been scurvily treated by his employers, and that the procedure adopted by the Corporation was discreditable to its reputation and unworthy of a great city.

We are glad to see that prompt action was taken by the Associated Municipal Electrical Engineers, whose executive committee lodged a protest against the condemnation of Mr. Mitchell without impartial inquiry, and urged that experts should be appointed to carry out a thorough investigation of the administration of the department, as we suggested in our last issue. The National Association of Local Government Officers also, pointing out that the personal character and conduct of Mr. Mitchell were not in question, called for a searching inquiry on behalf of his professional reputation, and described the manner of terminating his services as "harsh and inconsiderate"; and these official communications were backed by a petition signed by nearly 2,000 ratepayers, including some of the largest in the city, stating that public confidence had been shaken and could only be restored by thorough investigation into the Glasgow municipal administration—apparently in all departments.

In view of the many references that have been made—in the Council itself, in Mr. Mitchell's reply to the report, in the local Press, and in our own pages—to the fact that the report was an attack upon the Electricity Committee rather than upon the manager who acted under its orders, it must be regarded as a matter for surprise that Mr. Mitchell's letter and those of the two associations were remitted to that committee for consideration. After what has passed we have no confidence in the ability of that committee to deal justly with the case, in which it should stand by Mr. Mitchell's side as co-defendant. That is the view also of the *Glasgow Herald*, and the *Evening Citizen*, which has devoted several leading articles to the subject, likewise voices public opinion that the Corporation has bungled badly, that Mr. Mitchell has been made a scapegoat, and that an inquiry should be held into the affairs of the city as a whole. Certainly the only hope for the Corporation to

come out of the matter with clean hands and unsullied reputation lies in its welcoming impartial and exhaustive investigation—for the City Council itself is now on its trial.

The Marking of Imported Cables.

In this issue we abstract the report of the Board of Trade Committee which recently held an inquiry into an application for the compulsory marking of insulated wires and cables, under the Merchandise Marks Act, 1926.

The Committee's recommendations, which will no doubt be adopted by the Board of Trade, are in favour of the principle of marking imported wires and cables, although they are opposed to such rigid requirements as were suggested by the applicants—the Cable Makers' Association.

The evidence apparently convinced the Committee that there was a need for a marking Order owing to the difficulty of distinguishing British from foreign products. It was not considered that the difference in price was always a sufficient guide, and there were grounds for believing that on occasion there were deliberate attempts to deceive the purchaser. These reasons appear to us to be ample justification for an Order. If buyers want foreign cable they should not object to the appearance of an indication of its origin. If, on the other hand, they require British cable, they are entitled to protection against attempts to deceive them. Then, again, if the seller of the cables is honest, he should not mind marking, but if he is not, he is not worthy of any sort of sympathy.

The only sound objection to marking, and one which must necessarily receive every consideration, is that it might be expensive, or at least add appreciably to the price. The Committee has been very careful in dealing with this point, and appears to have reached a reasonable decision. It considers that the marking of the drums of heavier cables will give adequate indication; it seems unlikely that attempts to re-wind them on unmarked drums would be made. As for the smaller sizes, the recommendation is that the spools or containers should be marked and labels should be used. At the inquiry the opponents agreed that if marking was considered necessary, these methods were the least objectionable to them.

The Committee thus appears to have reached a compromise which, if it does not exactly please both parties, will secure the object for which the Act was passed—the protection of those who wish to buy British goods.

This was the second inquiry of direct electrical interest which the Committee has conducted. The first included electrical porcelain, and the Committee did not consider that the importation was of sufficient magnitude to warrant its inclusion in the Order which was recommended for porcelain generally. The third inquiry concerned incandescent lamps, and the Committee's conclusions have yet to be published.

Electrical Hire-Purchase.

With further reference to the general subject of payment for electrical and other goods by instalment, which was fully dealt with in our leading columns some weeks ago, we notice that the matter continues to receive a good deal of publicity in the newspaper—more particularly the financial—Press. The chairman of one finance company has been stressing the advantage of spreading the risks by extending credits over a large number of purchasing customers incurring small credits, instead of limiting it to a comparatively few producing companies who required large overdrafts. Beyond this there has appeared little new matter worthy of quotation, but it is reported in one paper that a public company with a considerable capital will be floated shortly to deal exclusively with hire-purchase business. It is agreed that interest in the subject is spreading rapidly both in this country and on the Continent, and that for some time past it has been discussed closely amongst bankers.

Artificial Light in Foundries.

A contemporary stated recently that there were still foundries in which the equipment had not been improved for fifty years. It is undoubtedly true that many foundries are very imperfectly lighted, though some of them require artificial light throughout the day. There are many foundry owners who fail to realise that a heavy lighting bill is a cheap price to pay for the health and efficiency of the workers. The lighting of a foundry which specialises in one kind of repetition castings is much simpler than that of a large jobbing foundry with deep moulding pits. In recent visits to some large jobbing foundries even oil lamps have been found in use for local lighting; surely electric torches would be much more efficient, better for the eyesight, and as economical. It is generally admitted that production and quality suffer from poor lighting, and the accident risk is increased when vision is rendered difficult and uncertain.

A paper was recently read on this subject before an American technical society. The recommended illumination in foot-candles for the various foundry operations was as follows:—Bench-moulding and core-making, 10 foot-candles; floor-moulding and core-making, 6 f.-c.; charging furnaces, casting, shaking out, cleaning, chipping, tumbling, and annealing, 5 f.-c.; pattern store, 3 f.-c.; raw stock storage, 1.5 f.-c. It is not quite clear why bench moulding should require better light than floor moulding, because the latter, whilst it is concerned with the production of larger castings, must be as accurate as bench moulding. With regard to the pattern store, much depends on the method of storing; the racks are usually placed close together, and a system of local lighting is necessary—usually portable lamps with a long "flex" are best. Experience has shown that for illuminating foundries, steel reflectors having a porcelain enamelled reflecting surface are the most satisfactory. In the paper already mentioned, the statement is made that a general overhead lighting system is more economical than the local or drop-cord method; in only a few exceptional cases should the latter be adopted, and then only to supplement the general lighting. Inspecting deep and narrow moulds is an example of work in which it is necessary to use the drop-cord method. In such cases a fairly low-power lamp fixed in a small, deep-bowl steel reflector, so that direct light does not fall on the workman's eyes, should be used. This would be better than either oil lamps or electric torches.

Electrons at Large.

Long years ago, Sir William Crookes produced in evacuated tubes what, with prophetic insight, he described as "matter in a fourth state"—neither solid, liquid, nor gaseous. His rays have been identified, in the light of later knowledge, as streams of electrons, which in the radio valve have become the plaything of millions of amateur experimenters, to say nothing of the workers to whom in various ways, they provide the means of earning a living. But, except for the small-scale achievements of Lenard, the electron stream has hitherto been confined to the interior of a glass bulb.

Dr. W. D. Coolidge, however, who has done so much to advance the cause of physical science, has brought to bear on the subject the powerful resources of the General Electric Company's Laboratories at Schenectady, and by devising vastly improved "tubes," and employing pressures of the order of a million volts, has generated streams of electrons in the open air. Remarkable phenomena have been observed, not unaccompanied with danger to the observers—Dr. G. W. C. Kaye, who has witnessed some of the experiments, says that the electron stream is equivalent to that emanating from a ton of radium. It is anticipated that important results will be obtained in various fields of physical science with the aid of this new and extremely powerful agency.

Is the Domestic Consumer Overcharged?

The author analyses the statistical returns of the Electricity Commissioners and shows that, on purely economic grounds, the domestic consumers are contributing more, and the power consumers less, than the mean costs of their respective supplies.

By D. J. BOLTON, author of "Electrical Engineering Economics."

THE Electricity Commissioners, in addition to their annual reports and other publications, have now published two statistical returns giving full engineering and financial details of public electricity supply in this country for the four years ending December 31st, 1924 (or May, 1925, for municipalities). In the present article it is proposed to draw certain conclusions from these figures with reference to the various classes of consumers served. Before doing this, it will be well briefly to state the relevant facts as given in the return, and to illustrate them by means of one or two diagrams.

Taking the last year (1924) for which figures are given, one of the most striking facts which emerges is that the lighting and domestic consumers, whilst they accounted for only one-fifth of the total units sold, contributed practically 50 per cent. of the total revenue. In contrast to this, the other large class of consumer, the power group, contributed less than half the revenue (42 per cent. of the total), whilst consuming nearly 70 per cent. of the total units sold in the country. Besides these two large groups, the other classes of consumer distinguished in the return are "Traction," "Public Lighting," and "Unallocated," of which only the first represents any considerable quantity of consumption. In fig. 1 the total kWh sold during 1924 are plotted vertically, and the mean price per unit for each group of consumers is shown horizontally. This gives a series of rectangles whose areas represent the total revenues from the groups of consumers shown.

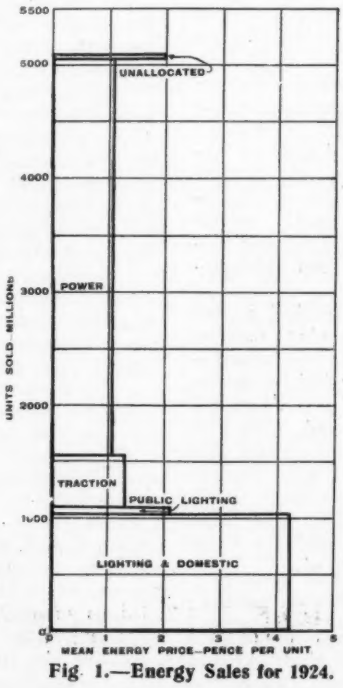


Fig. 1.—Energy Sales for 1924.

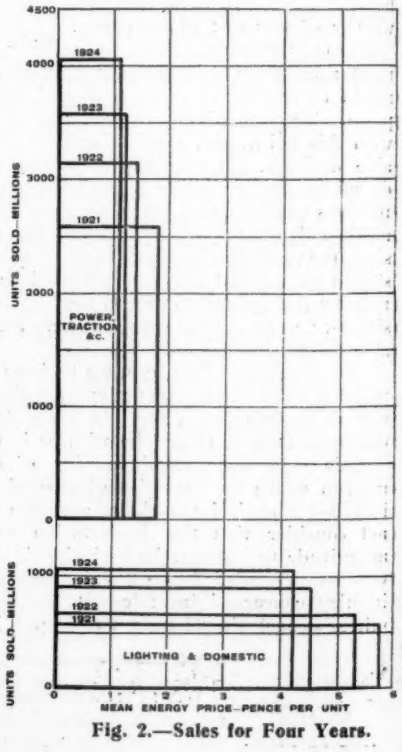


Fig. 2.—Sales for Four Years.

In order to exhibit the results for all four years, it will be well to group all the cheap energy consumers together, and to contrast them with the lighting and domestic group. Fig. 2 shows these two groups plotted separately for the four years dealt with in the return. This diagram is of the same type as the previous one, but in this case the two sets of rectangles each have their own zero points. Two facts emerge very clearly from the figures thus illustrated. The first is the steady and progressive improvement evidenced in the four years, which can be summed up by saying that the output has gone up each year at a greater rate than either the capital or working expenses, thus resulting in a steady reduction in the price charged, which has generally been obtained without any diminution in the rate of loan repayment or profit.

The second fact which is clearly shown is the very great difference in the prices charged for the two groups. The domestic group contributed nearly half the revenue in all four cases (the actual figures rising steadily from 41.5 per cent. to 49 per cent. of the total), but only accounted for a small proportion of the consumption. Hence, while the areas of the two rectangles in any one year are approximately the same, those representing the domestic consumption are long and shallow, indicating a small sale at a high price, and in the other case they are tall and narrow. Thus, in 1924 the average price per unit to the domestic consumer was 4.2d., whilst the average for all other consumers worked out at 1.12d. (or for power alone 1.07d.), and the question naturally arises—is so wide a difference justified by the circumstances of the case?

In posing a question such as that contained in the title of this article, the answer must naturally depend on what is meant by "overcharged." Roughly speaking, there are two sets of considerations on which a tariff may be based—those of economy and those of policy or expediency. From the point of view of the former, the question could be put—"does the domestic consumer pay more than his fair share of the cost of supply, reckoned on a strictly economic basis?" This must always be the chief consideration in tariff fixing, but it need not be the only one, and, above all, the matter should not be regarded too statically, *i.e.*, it is not only present costs, but probable future costs and takings which must be considered.

As regards the second group of considerations, those of a not strictly economic character, it is clear that a tariff may be based upon the value of the service rendered, upon ability or willingness to pay, or upon questions of national advantage. Thus, a high-class residential district will use electric lighting whatever the tariff (within reason), whereas it will require much more generous treatment if it is to use electricity extensively for heating or cooking; hence the difference between the prices charged will tend to be more than can

be justified on purely economic grounds. In such a case the lighting and heating loads are like the rich and poor patients of a medical practitioner—he charges differently for his services in the two cases, but his combined income from them both is sufficient to support him. When questions of national (or even international) policy also come in, such as the encouragement of rural industries or the reduction of smoke pollution, it will be evident that these bases of tariff fixing, whilst they are very important and are always present to some extent, are much too wide for treatment in a short article.

In what follows, therefore, only the economic basis will be considered, and the question then becomes—Does the average domestic consumer do more than pay the expenses incurred in giving him his supply, which would not be incurred if he (and his like) were not there? One way of approaching the subject is to examine every possible difference between the two types of consumer and see whether in all they are adequate to justify so considerable a difference in price. Owing to the large number of variables, such a task is by no means easy, but in order to simplify the problem, all the various differences which can arise between one consumer and another, and between one type of consumption and another, can be put into two groups—differences which are fixed more or less finally at the time of installation, and differences which fluctuate with time and are generally in the power of the consumer to modify.

The fixed items are:—Pressure and type, *i.e.*, h.p. or l.p., a.c. or d.c., single- or three-phase; and situation, *i.e.*, distances from the station and from other consumers, favourable positions as regards coal, water, and so on.

The fluctuating items are:—Load and diversity factor and power factor.

In order to simplify the problem still further, it will be assumed that the items in the first group affect only transmission and distribution costs; as regards the second group only load and diversity factor will be considered, questions of power factor being omitted entirely. This will, if anything, be unfair to the domestic consumer, who usually has a very good power factor, and will certainly not tend to exaggerate the conclusions reached. There will then be left two sets of differences to account for the wide divergence in the price charged, namely, differences in load and diversity factor (affecting all costs), and differences in the type or situation of supply (affecting only transmission and distribution costs).

Turning now to the actual costs of supply in this country in 1924, it will be convenient to divide these into two groups, standing and working charges, so that they can be expressed in the form of a two-part tariff capable of looking after differences in load and diversity factor. In order not to put the case too favourably for the low-load-factor consumers, the only items included under working charges will be the cost of the fuel, modified later by the losses in transmission. From the table below it will be seen that this gives a working charge of 0.28d. per kWh at the station, and 0.33d. per kWh after distribution (losses *en route* = 15.4 per cent.).

Putting all other costs into the standing charge (which is to be expressed per kW of demand), these will include the running expenses other than fuel, overhead charges and capital items (interest, depreciation, loan repayment, &c.). In the year in question these totalled 14.6 million pounds on account of generation and 15.4 millions on account of transmission and distribution, the expenses of management, rates, &c., having for this purpose been divided proportionally between the two. The aggregate maximum demand on the generating stations amounted to 2.3 million kW, and this gives a standing charge for supply taken at the station (assuming a diversity factor of 1.125) of $£14.6/2.3 \times 1.125 =$ £5 13s. per annum per kW of demand. In a similar way the standing charge for supply as distributed to the "average" consumer can be calculated by including the transmission and distribution costs, but before doing this it is necessary to assume figures for two items not given in the returns, namely, the kW lost in transmission and the diversity factor.

As regards the former item, the losses will reduce the kW capacity to meet consumers' demands, but not to the same extent as it reduces the units delivered, and the figure here assumed is 10 per cent. The various diversity factors existing between consumer and station, here assumed to amount to a total of 1.25, will have the effect of virtually increasing the kW available to meet individual consumers' demands. Hence the net result is a charge to the consumer of $£30/2.3 \times 0.9 \times 1.25 =$ £11 10s. per annum per kW of his demand, which, with the figure of 0.33d. per unit consumed, will make up his total tariff. If the same set of figures is applied to the question of load factor, it will be found that the average at the generating station, which is given in the Return as 30 per cent., will become modified by the differences in the losses and by the diversity factor to an average figure of about 22 per cent. for the individual consumer.

For a consumer of any particular load factor it is then possible to add these two components of the cost and so make up an overall price per unit. Thus for the "average" consumer, having a load factor of 22 per cent., his price per unit will be $0.33 + 11.5 \times 240/0.22 \times 365 \times 24 = 1.75$d. This, of course, agrees with the figure given in the Return as the average price per unit for all the energy sold that year, and thus confirms the conclusions so far made.

It need hardly be pointed out that the above figures do not represent an average two-part tariff for the whole country, but are merely an allocation of the total receipts (or expenses) on a two-part basis. They represent an average covering, not only power users paying on this basis, but also domestic consumers paying largely on a flat-rate basis. Moreover, before applying these figures as a method of dealing with the different load factors characterising power and domestic consumers, it is necessary to consider the other main difference mentioned above, that of situation and type of supply. In any given system it should be possible to work out with some degree of accuracy the necessary figures, but this is clearly impossible for the country as a whole. The utmost that can be done is to make an extremely sketchy estimate, and the following is an attempt at this.

TABLE.

Cost (A).		*Magnitude (B).*		*Ratio (A/B).*	
				Working charge (per kWh).	
Cost of fuel	£$7{\cdot}11 \times 10^6$	kWh generated	$6{,}622 \times 10^6$	Cost per kWh generated ...	0·28d.
		kWh sold	$5{,}096 \times 10^6$	" " sold	0·33d.
				Standing charge (per annum per kW of demand).	
Annual cost of generating plant plus proportion of management, &c.	£$14{\cdot}6 \times 10^6$	Aggregate maximum demand on generating stations ...	$2{\cdot}3 \times 10^6$	Cost at station (assuming 1·125 diversity factor)	£5 13 0
Ditto ditto for transmission and distribution	£$15{\cdot}4 \times 10^6$			Cost to consumer (assuming 10 per cent. losses and 1·25 diversity factor)	£11 10 0
Total	£$30{\cdot}0 \times 10^6$				

It is evident that the domestic consumer on the average takes his energy at a lower potential, on a smaller scale, and in a less convenient form (from the point of view of the supply authority) than does the average power user—in fact, at a later stage in the transmission

scheme. Thus the transmission and distribution costs, even reckoned on a demand basis, should be heavier for the former group and lighter for the latter than the average given for the whole country. Referring again to the table foregoing, it will be seen that the price per kW of demand to consumers purchasing at the supply station works out at just about half that to the average consumer. Now a power user may be presumed to purchase somewhere between the generating station and the point of low-pressure domestic distribution, so that his charge per kW should lie somewhere between half (representing generating costs) and one times the charge to the low-pressure user. A figure of three-quarters may be tentatively suggested.

The Return shows that the non-domestic users consumed four times as many units as the domestic, but, owing to their far better load factor, their kW of demand would not be in anything like this ratio. Hence let it be supposed that half of the kW demand is due to non-domestic users, and that they pay three-quarters of the price per kW of demand that the domestic users do. In order to bring in the same total revenue as before, the two-part tariff must now be 0.33d. per unit plus £13 5s. per annum to the domestic, or plus £9 19s. per annum to the non-domestic users per kW of demand.

Having now obtained revised two-part tariffs for the two groups of consumers, it only remains to see whether these groups are in fact paying less or more than they should according to the tariffs. As regards the power users, there can be very little doubt that a tariff of nearly £10 per annum per kW plus one-third of a penny per unit is considerably above the average charged in the country. And as regards the domestic consumers, it seems equally clear that a tariff of £13 5s. per annum per kW plus ½d. per unit is considerably less than they are on the average charged. For in order to amount to an overall figure of 4.2d. (the actual average for the country) the load factor of such consumers would have to be only 9.4 per cent., which is appreciably below what could be reasonably assumed for this class of consumer. Moreover, in dealing with load factors of this small magnitude, the diversity factor would almost certainly be higher than the mean figure assumed above, particularly as the domestic consumption includes appreciable amounts of non-lighting load.

The final conclusion, then, is that as regards the total receipts for electricity supply in this country, the domestic consumers are contributing more, and the power consumers less, than the mean costs of their respective supplies, in so far as these can be estimated. But as was pointed out at the commencement, this is by no means necessarily a condemnation of the supply authorities, or even an injustice, since factors such as service rendered and general policy must also be considered. Indeed, ultimately the supply industry may come to be regarded in the same way as the postal service, not as something on which a profit must be made in every section of every branch, but as something which has to be run profitably as a whole, and administered in the best interests of the country in general.

Electrical Developments at Shoreditch.

The recently inaugurated extensions at the Metropolitan Borough of Shoreditch include a new 10,000-kW turbo-alternator, a 70,000-lb. boiler, and a 1,400-kW mercury-arc rectifier bank at the Evelyn Street sub-station, which, it is claimed, makes the sub-station the largest of its kind in the world.

THE history of the Shoreditch electricity undertaking dates back to 1891, when the Vestry—as it was in those days—applied to the Board of Trade for authority to provide a public electricity supply; a Provisional Order was granted in the next year. The original generating works, Coronet Street, were opened by the late Lord Kelvin in 1897, having a plant capacity of 705 kW. The supply was given on the two-wire Oxford system. Within five years it became necessary to erect a new power station on a site which afforded scope for greater development, and the Whiston Street power station was opened in 1902. The total plant capacity of the two stations at that time was 3,055 kW, but within the next few years this figure was increased to 6,055 kW. During this period also the system of supply was changed to the three-wire, 480-240 V. In 1919 the first of the two existing 5,000-kW, 50-cycle, three-phase turbo-alternators, 6,600 V, was put into commission. This was supplied by the British Westinghouse Electrical Manufacturing Co., Ltd., now the Metropolitan-Vickers Electrical Co., Ltd., which manufactured the second 5,000-kW set, which was installed in 1923. Two additional Stirling water-tube boilers, each having an evaporative capacity of 33,000 lb. per hour, were also put in, and in the following year a further 46,000-lb. Stirling boiler was added.

In 1925, the Electricity Committee submitted a scheme which involved the extensions which are the subject of this article. The new plant, which has been obtained at a capital expenditure of about £93,000, includes a 70,000-lb. boiler and a 10,000-kW turbo-generator, with the necessary switchgear and auxiliaries, at the power station, and a new sub-station at Evelyn Street equipped with mercury-arc rectifying apparatus.

The new boiler plant includes a Stirling water-tube tri-drum boiler, fig. 1, complete with superheater, stokers, economiser and forced- and induced-draught fans. The boiler capacity is 70,000 lb. per hour. When inquiries were issued for this latest unit, the specification called for a duplicate boiler to the 46,000-lb. one, or one giving the greatest possible evaporation for the space available, and it is very interesting to note that, as compared with the previous installation, 52 per cent. increase in evaporation has been obtained upon practically the same floor space. The plant has a heating surface of 7,633 sq. ft., is designed for a working pressure of 212 lb. per sq. in., and is entirely steel cased. An integral type of superheater results in a final temperature of 591.9 deg. F. The boiler is fitted with two Babcock & Wilcox chain-grate stokers, each 16 ft. long, providing a grate area of 272 sq. ft.; these are boxed-in and fitted with special narrow-type links, so as to allow of the efficient burning of small fuel. New and independent mild-steel overhead bunkers have been installed in conjunction with the new boiler. These have a capacity of 600 tons, and bring the total bunker capacity for the station up to 1,250 tons. A basement below the boiler is used for the reception of the ashes, steel-plate brick-lined hoppers being provided with special rack and pinion doors. Accommodated in this compartment is also the forced-draught fan supplying the necessary air for the stokers. This is of the Sirocco type, has a diameter of 30 in., and is driven by a Laurence-Scott motor. An economiser of Messrs. Green's manufacture, having 240 tubes, is

Fig. 1.—70,000-lb. Water-tube Boiler.

Fig. 2.—Remote-control Switchgear.

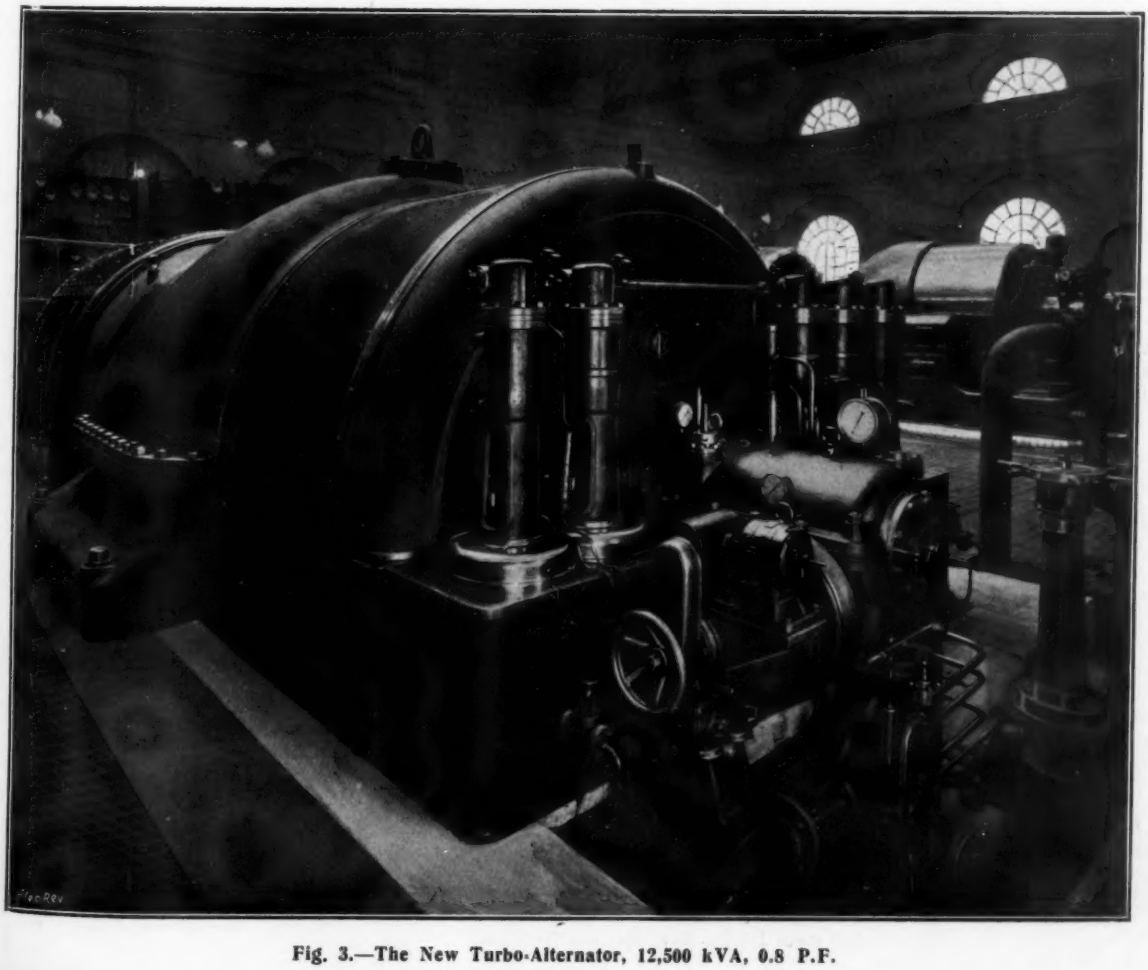


Fig. 3.—The New Turbo-Alternator, 12,500 kVA, 0.8 P.F.

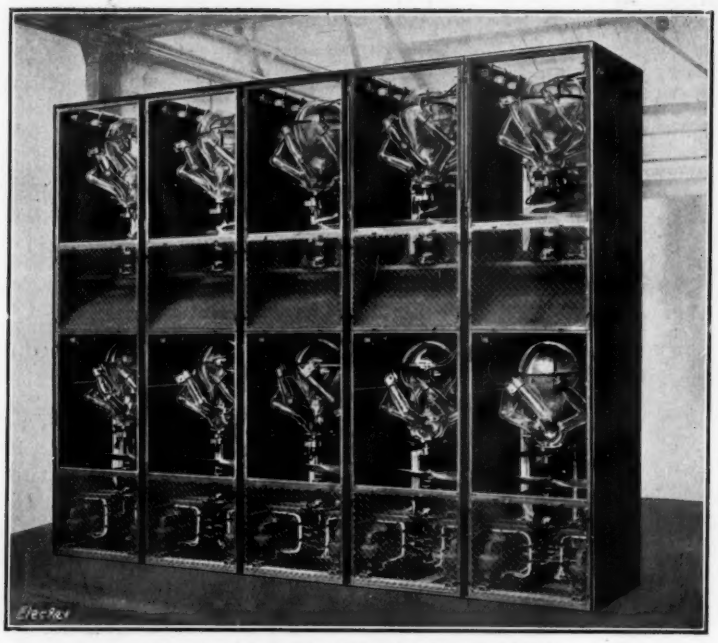


Fig. 4.—Section of 1,400-kW Rectifier Bank.

Fig. 5.—E.h.p. and d.c. Switchboards at Evelyn Street.

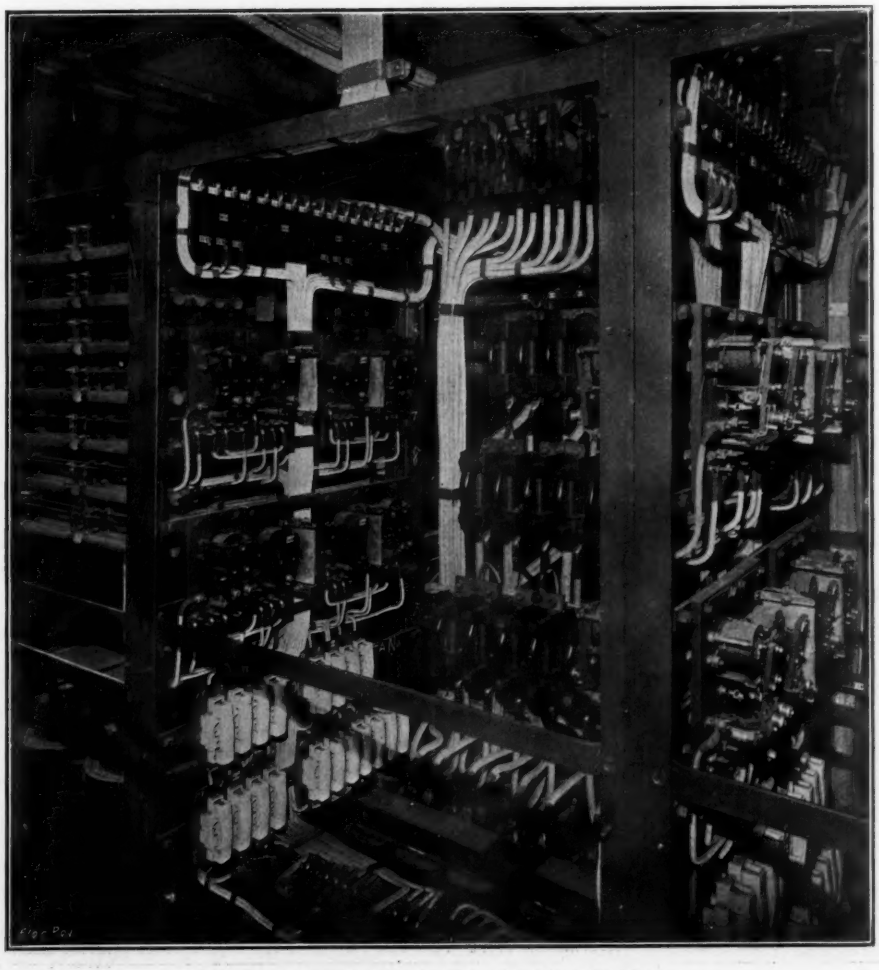


Fig. 6.—Automatic Control Gear for New Rectifier.

Fig. 7.—Original Rectifier Bank.

situated upon a separate floor immediately above the boiler. The boiler is provided with modern instruments, including a Kent's boiler-load indicator, a portable pyrometer and draught gauges.

The turbine, fig. 3, was supplied by the Fraser and Chalmers Engineering Works of the General Electric Co., Ltd., and is of the high-pressure impulse multi-stage type, 3,000 r.p.m., 200 lb. per sq. in., 150 deg. F., and designed for a normal load of 10,000 kW. The high-pressure portion of the turbine embraces some new features. The efficiency is claimed to have been considerably improved by replacing the first stage by a number of stages of comparatively small diameter, each utilising a small heat-drop only. The rotor blades in the high-pressure part are attached to a sleeve provided with grooves in which the blades are securely inserted by means of specially designed roots. The sleeve is arranged on the shaft with a small clearance so that the shaft is protected against the high temperature of the sleeve. In the low-pressure portion, wheels are used to carry the moving blades, these being securely fixed to the rims of the wheels by means of a patented method of riveted fixation. Every blade is milled from a solid nickel-steel bar, a process which, it is claimed, relieves any internal stresses that may exist in the body of the metal. Another point of importance is that the glands, both at the h.p. and exhaust ends, are of similar design, consisting of boxes in halves attached to the top and bottom halves of the casing respectively, and of sleeves mounted on the shaft. The turbine is bled at two points, representing absolute steam pressures of 29.6 lb. and 6.6 lb. respectively.

The condensing plant is of the Hick-Breguet surface type, and was supplied by Messrs. Hick, Hargreaves and Co., Ltd. It is designed to deal with 119,000 lb. of exhaust steam per hour and maintain a vacuum of 28½ in., with a barometric pressure of 30 in., when supplied with circulating water at a temprature of 75 deg. F. The amount of circulating water required is 951,000 gal. per hour, the cooling surface being 13,750 sq. ft. The circulating pump is operated by a 228-b.h.p. motor capable of delivering 16,500 gal. of water per min. against a head of 30 ft. A steam ejector is employed in conjunction with the condenser for air extraction.

The construction of the alternator, which was also manufactured and supplied by the General Electric Co., Ltd., is of massive character. The normal rated output is 12,500 kVA at 0.8 p.f., 6,000/6,600 V, 3,000 r.p.m., but owing to the exceptional power factor of the system —the distribution at Shoreditch is wholly d.c.—the alternator can be loaded to the extent of 15,000 kVA. The stator frame is a 40-ton casting, while the rotor is a single steel forging weighing 10 tons. A totally enclosed system of ventilation has been adopted for the alternator, the air being circulated in a closed circuit by means of fans on the rotor. A surface cooler incorporated in the system utilises as the cooling medium the condensate and make-up water. Circulating-current type protective gear is employed for the alternator.

The e.h.p. switchgear for the new set was supplied by the British Thomson-Houston Co., Ltd. It is of stone cellular construction with steel doors, and is arranged on two floors. Duplicate bus-bars are provided, together with the necessary selecting switches. The oil circuit breakers are of the B.T.-H. motor-operated, explosion-pot type. The instruments and auxiliary apparatus for the control of the e.h.p. switchgear are mounted on a black enamelled slate, bench-type control board, fig. 2, installed in a gallery overlooking the engine room.

The outstanding feature of the extensions is perhaps the new 1,400-kW bank of rectifiers at Evelyn Street, supplied by the Hewittic Electric Co., Ltd., which brings the total capacity of the station up to 2,300 kW, so that it ranks, it is claimed, as the largest glass-bulb rectifier sub-station in the world. The original mercury-arc equipment in this "sub" was a 600-kW bank, fig. 7, which was installed in 1925 in what is now a wing to the building. This original equipment was later extended so that it now comprises two rectifier banks totalling 900 kW. Provision has been made in the building for the installation of a total of 6,000 kW of mercury apparatus. When the original sets were ordered, the advantages of this type of equipment from the points of view of simplicity, performance and control were sufficiently evident in practice, but some doubts were entertained regarding the life of the bulbs. Up to the present, however, it has not been necessary to change a single bulb, and the original plant has proved entirely satisfactory in all respects. The new set, with the original ones, is arranged to feed into the three-wire 500/250-V network. It is fed at 6,600 V, three-phase, 50 cycles, from the Whiston Street station, and is remotely controlled from Coronet Street.

The a.c. switchgear consists of a G.E.C. three-panel truck-type switchboard, fig. 5. The left-hand truck controls the h.p. side of a 1,850-kVA Hackbridge transformer, and is equipped with a motor-operated remotely controlled oil circuit breaker of 100,000 kVA breaking capacity, a three-pole overload and inverted time-limit relay, and a 250-A ammeter. The control equipment for the motor-operated oil switch is housed in the right-hand truck, the necessary supply being furnished by a 1-kVA transformer. The centre truck serves for the main incoming feeder, and is equipped with a manually operated circuit breaker and the necessary protective equipment and instruments. At present, pending the completion of the necessary pilot cabling from Coronet Street, the equipment is controlled locally.

The d.c. side of the rectifiers is fully automatic, the Bertram Thomas control equipment, fig. 5, right, serving for this purpose. The circuit breakers are of the auto-reclose type, and are arranged to open on severe overload or short circuit, and to close as soon as normal conditions are resumed on the network. They also open when the rectifier bank is shut down on the e.h.p. side, and switch the rectifier on to the bus-bars as soon as it begins functioning by being made alive on the primary side.

An interesting point worth mentioning in passing is the d.c. feeder board shown on the gallery in fig. 5. It is designed to deal with a total load of 12,000 A, and was built entirely by the department. The fuses are constructed with teak handles, lined with black fibre, and are equipped with strips of tinned copper and lead. It is claimed that these will carry 1,400 A and keep cool, but will "blow" efficiently and safely on "short-circuit."

In order to obtain the maximum efficiency afforded by operating the rectifier bulbs at as high a d.c. pressure as possible, the majority of the bulbs are arranged to feed directly across the outers of the d.c. system; sixteen 75-kW bulbs arranged in groups of four serve in this connection. In addition, four 50-kW bulbs, two groups of two each, feed between the inner and outers to assist in balancing. The rectifiers are arranged in double-tier cubicles in two sections, one of which is shown in fig. 4, and each group is provided with independent l.p. isolating switchgear on the a.c. and d.c. sides. This arrangement has proved of considerable advantage in that any group may be cut out of circuit at any time for repair, cleaning, and so on, without materially affecting the supply. One of the difficulties in connection with the maintenance of the bulbs has been to provide adequate cooling. An elaborate ventilating system has been installed in connection with the new apparatus, and seems to have overcome this trouble completely. Ducts are arranged from the roof to the foot of the rectifier cubicles, so that the bulb fans can draw an ample supply of cool air right through the bulb housings. The new part of the sub-station is provided with a basement in which is installed the automatic control equipment, fig. 6. All the positive feeders enter the sub-station at one end of the basement and the negative ones at the other end.

An interesting feature is in connection with the supply transformer. Its primary is delta wound, and the secondary is arranged with 12-phase zig-zag windings for feeding the bulbs connected across the outers, and two six-phase windings supplying the balancing bulbs. The main voltage regulation is effected on the a.c.

side. A 6,600-V, 3-phase induction regulator controls the supply to the transformer, and a second regulator is installed on the l.p. side and controls the balancing units. Both regulators are operated by motors under the control of pressure relays governed, of course, from the d.c. side. A load-limiting device prevents the d.c. pressure from being raised when full load is reached, and causes it to be lowered in the case of overload. For the remote control from the Coronet Street station a suitable panel is equipped with push buttons and the necessary indicating instruments. One set of buttons, through a contactor, governs the e.h.p. switch, while another set serves for the pressure relays at the sub-station. For the local control, a similar panel is provided in the sub-station. The 0.25-sq. in. e.h.p. feeder cable for the new equipment is of the "Diatrine" paper-insulated, lead-covered type, with B.O.T. earthing shield, and was supplied by Messrs. W. T. Glover and Co., Ltd. The sub-station building was designed by the Borough Surveyor's Department, and was erected by Messrs. R. Schooley & Son.

Shortly after the extension scheme was sanctioned, Mr. C. Newton Russell, M.I.E.E., relinquished the position of borough electrical engineer, which post he had held with distinction since the inception of the undertaking. He was succeeded by Mr. W. Weekes, A.M.I.E.E., who was for many years chief assistant engineer and mains superintendent to the concern, and to whom we are indebted for facilities to obtain the above information.

Lightning Protection.

A new method of safeguarding against lightning which, it is claimed, actually prevents lightning strokes, has been devised.

In an article by Colonel E. H. Wilcox, published in the *Scientific American*, a system is described which aims at protection from lightning effects by the actual prevention of discharges, within a certain area. The "Cage" system, as it is called, an invention of Mr. John M. Cage, of Los Angeles, operates by gathering into itself the ground charges which would have existed within the protected area, and liberating them to the charged thunder cloud by ionic discharge so distributed in time and space that no destructive discharge can take place over or within the protected area. In this way the "impulsive rush" is replaced by corona leakage, ionic discharge or dissipation.

This is accomplished by erecting steel towers of suitable height around the area, and connecting them at the tops by a ring of wires arranged in a horizontal plane with numerous spaced sharp points from which the "upward discharge" can take place. The wires are properly earthed and interconnected electrically with the object or objects it is desired to protect.

The practical questions which presented themselves for solution were: At what rate could such a system liberate its charge to the cloud by dissipation; what could be known of the charging rates of the cloud and the amount of energy which must be taken into consideration in order to ensure complete protection; what was the minimum area of cloud and ground for inclusion in the system for it to be effective; and what mechanical arrangement would give the desired results?

Experimental work was carried out, and for qualitative work a miniature "cloud" consisting of a disk of small-mesh wire-netting with a heavy wire ring supporting the perimeter was used. The "cloud" was charged with d.c., and observations were made with respect to miniature oil reservoirs beneath. The cloud would spark across 6 or 8 inches of air to the tanks when they were unprotected, but it could only spark across ¼ in. with the protective system in place. In other words, the voltage stress was reduced from, say, 60,000 V to, say, 2,500 V. In quantitative tests, using 250-kW, 250,000-V transformers, sparks 31 in. long could be produced. A metal cloud 12 ft. square and a dissipating system covering 10 sq. ft. were used for determining the current, without flash, at varying gradients.

Practical installations consisted of a system of three parallel wires arranged in a horizontal plane and spaced four feet apart, with dissipating points at intervals not exceeding 6 inches, which repeated experiments showed to be about the best spacing for such a system.

With a high-hanging cloud there is much greater discharge at a given gradient than with a low-hanging cloud, and as all the laboratory experiments were made with comparatively low-hanging clouds, there is promise that the dissipative action of a system may be even greater than the experiments indicate.

The author suggests that due to the spectacular appearance of a lightning flash there is a great misconception as to the quantity of electricity involved. Disastrous effects result from the intense concentration, both in time and space, rather than from the amount of energy. The building-up period of a charge takes an appreciable time, and the charge to discharge ratio may be as much as 50,000 to 1. If the charge can be dissipated simultaneously with its generation, only a very small amount of energy need be handled in a given unit of time. The action of a properly designed Cage system is, therefore, that as the charge begins to build up in a cloud, a small but steady release of earth charge to the cloud will occur. Until the rate of the ground discharge balances the cloud-charging rate, the potential difference between the cloud and earth will rise. This means an increased rate of discharge from the earth until equilibrium is reached. This is maintained at a potential gradient so low that there is no possibility of a lightning flash. Fig. 1 shows a "Cage" system protecting a large oil-storage reservoir.

Fig. 1.—A "Cage" Lightning Prevention Installation.

The claim made by Colonel Wilcox for the system outlined above, that lightning strokes are actually prevented, appears to be so general that we have asked Mr. Killingworth Hedges, M.Inst.C.E., who with Sir Oliver Lodge and the late Sir John Gavey drew up the report of the Lightning Research Committee of 1905, to comment on the subject.

A Constructive Criticism of the "Cage" System.

By KILLINGWORTH HEDGES, M.Inst.C.E.

The protection of large areas where petroleum tanks are assembled has been the subject of investigation, both in the United States and Mexico, and various methods have been put forward. The immense capital losses as the result of fire due to lightning strokes in such places emphasises the importance of the subject; for instance, it was stated that the fire which took place at San Luis, Obispo, California (an illustration of which appeared in the *Daily Mail* of April 22nd, 1926), could not be extinguished, and the burning oil was only prevented from spreading over the adjoining land by enlisting an army of men to dig up trenches around the area.* The method advocated by Colonel Wilcox is an elaboration of a system which has been installed in America for protecting a building by placing conductors on high poles at angles outside the structure, with the same object of using the discharge from the earth. This plan, however, does not include the dissipating points which are the main feature of the "Cage" system. The writer realises the importance of a horizontal conductor, armed with points, on a large building. At Westminster Abbey and St. Paul's Cathedral six-point aigrettes in each case are jointed to such a conductor at intervals, and on the cathedral they actually encircle the roof. In Hungary barbed wire has been used for the same purpose. The question arises,

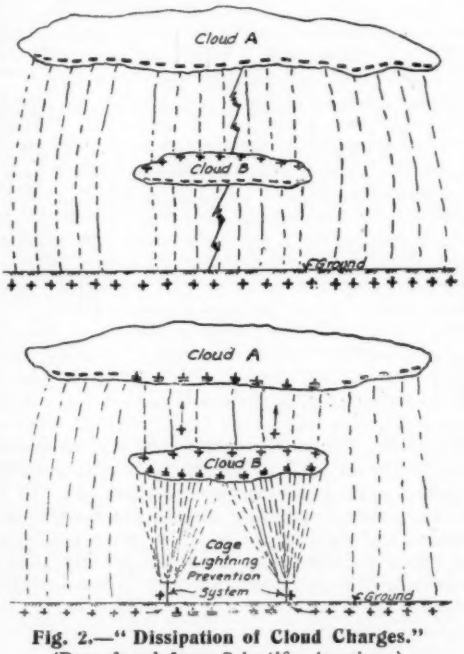


Fig. 2.—"Dissipation of Cloud Charges."
(Reproduced from *Scientific American*.)

however, as to whether a flash will penetrate an area protected by a cordon of pointed wires, *i.e.*, Cage's plan. An interesting experiment was conducted by the Anglo-Persian Oil Company at the Royal Society's Soirée in May, 1924, to show the selectivity of lightning discharges. High-pressure current passed through a revolving pointer looking downwards on the surface of a table, representing the earth, and different geological formations, selected small objects of varying dielectric and conductive values were placed on sand, and the 18-in. spark always struck the small objects instead of going direct to the nearer earthed plate. This experiment, and that quoted by Colonel Wilcox, deal only with a discharge from a metal cloud representing what was termed by Sir Oliver Lodge as an A flash, the result of a steady flow. It was shown by him that the neutralising effects of points is not so marked with the impulsive rush of a B flash. The Inspector of Explosive's report on the accident at the Tunbridge Explosive Works in 1918, when the hermetically sealed drums of nitro-glycerine were detonated, confirms Sir Oliver's deduction that a certain type of lightning flash is uncontrolled by lightning conductors; the report stated that "They were of the most modern type and in good order." The flash appeared to have separated into several distinct paths and gone to earth through the buildings without being affected by the conductors. The principle of gathering up earth charges and discharging them in such a manner as to neutralise the cloud charge, as adopted in the Cage system, is the most recent method of carrying out the ideas of Colonel Parnell, R.E., who, in a paper read before the Royal Institute of British Architects in 1884, emphasises the importance of the upward earth currents, which he terms "an electric tap ready to eject the whole charge that may accumulate in the ground." The practical results of Colonel Wilcox's installation will be awaited with interest, and his article in the *Scientific American* would not have been criticised if it had not included the statement "Sir Oliver Lodge wrong; the impulsive rush incorrect." In view of this assertion, the writer asked Sir Oliver to read the contribution, and has received his kind permission to publish the reply, which may interest those who have followed the subject.

The reply from Sir Oliver Lodge is as follows:—

December 19th, 1927.

Dear Killingworth Hedges,

Thank you for calling my attention to the article in the *Scientific American*, by Colonel Wilcox, about the Cage system.

There is, of course, nothing new in trying to neutralise the strain by a number of points; but Cage or Wilcox advocates depending on this plan entirely, and for that purpose erects a great ring of innumerable points all round the area to be protected. So far as it goes this is in the right direction and would tend to minimise danger. But he exaggerates and claims that it would entirely prevent every kind of disruptive discharge, incidentally saying that my arguments about a B flash were mistaken, and that what I really did call an "impulsive rush" in a previously unstrained region could not occur.

In that, of course, I do not agree. It is quite easy by experiment to get a discharge in a previously unprepared and unstrained region, *viz.*, what I call a B spark, which has to be precipitated by an A spark. I don't know whether he admits that or not; but, supposing he did, he would say that to get this effect in nature a cloud would have to be a non-conductor. This is not necessary at all; it might be a complete conductor, and still there would be a B spark under certain circumstances. However, I have always admitted that these circumstances are exceptional, and that points do give a fair amount of protection. It will be interesting to see how far his petroleum tanks are really protected under all conditions. To say that a flash would never occur to a series of points is an exaggeration. To take as an example the diagrams in fig. 2, in the upper diagram the potential of the top cloud might be V, that of the earth O, and the intermediate cloud B ½ V. In the second figure the potential of the intermediate cloud has been reduced by leakage, rain or points to that of the earth. The strain between it and the upper cloud is therefore increased, so that a flash to that cloud is more likely to occur. A flash means the reception of a quantity of electricity by the intermediate cloud, and therefore a sudden change of potential. Leakage has no time to equalise it, and it is liable to overflow instantly in an impulsive rush towards the earth, however many points may try to dissipate it. He might, perhaps, reasonably claim that in nature there is no such intermediate cloud, and that if there were only a single cloud the points would help to discharge it quietly—which, of course, is true enough. But he hasn't understood about the B flash.

Yours faithfully,

(Signed) OLIVER LODGE.

* A torch of flame, approx. 220 feet high, at the Magpie Vacelpool well, is illustrated at page 227 of "The Petroleum Industry," by A. E. Dundas.

Parcels by Passenger Train.

New Charges and Rules.

By J. W. PARKER, A.M.Inst.T.

ALTHOUGH the high charges associated with the carriage of goods by passenger train or similar service prevent any very large volume of electrical goods from using this means of conveyance, the position requires some attention, particularly under the revised arrangements and scales which became effective on January 1st. In the transport of goods, the passenger service still retains a field of operations peculiar to itself. Its boundaries are the parcel post on the one hand, the road motor and express delivery service on the other, whilst in the third direction the goods train may be a limiting factor.

From a legal point of view, the most prominent difference between the railways' responsibilities for goods and passenger train traffic, is that the companies need not carry most merchandise by the latter service; they must, however, convey perishables in this way. Despite a number of attempts to extend the railways' liabilities in this direction, the old position is strictly maintained by the latest piece of legislation—the Railways Act, 1921. In the fifth schedule, paragraph 10 (*c*) it is laid down that "the company shall not be under obligation to convey by passenger train or other similar service any merchandise other than perishables." It is thus clear that so far as the electrical industry is concerned, the railways carry by passenger train not as a duty imposed by law, but as a purely business arrangement. Nevertheless, they are subject to the jurisdiction of the Railway Rates Tribunal in the matter of charges. The effect of this is to give business interests some protection and consideration if for no other reason than that one of the three Tribunal members is a trade representative.

One of the main features of the new arrangement is brought about by the introduction of a classification of merchandise upon the same lines as the old freight G.R.C. Indeed, the new publication constitutes part 3 of the General Railway Classification of Goods. It is obtainable at a cost of 6d. or, if desired, can be seen at any station. Nearly all parcels now come within one of its thirteen divisions. The charging unit in most instances is the package, but in others it is the consignment or the truck, whilst the means of conveyance for the most part is the guard's van. In the first class come general parcels, and in the second, packages of a frail nature or bulky in proportion to weight. No. 4 is given over to empties and No. 7 to loaded vans, which are charged not upon a tonnage but upon a *truck* basis. The van loads are detailed under such headings as acetylene-welding plant, brass and copper bars, strips and sheets, bronze ingots, castings, dynamos, electrical accumulators, controllers, motors and armatures, regulating resistances, switchgear with ammeters, transformers, cables, fans, magnetos, telephones and radio apparatus. It will be obvious that some confusion will be caused between classes 1 and 2 unless the latter are clearly specified. To this end, the classification gives full particulars of all frail and bulky goods some of which are ammeters, vulcanite boxes, arc lamp carbons, light castings, ebonite, electrical apparatus like clothes washers, ironers, portable sewing machines, &c., fires, fuseboards, lamps, meters, testing sets, switches, ohmmeters, telephone and telegraphic apparatus, vulcanite, &c. A number of articles will be accepted only at owner's risk, and these include alabaster bowls, electric lamps and accumulators.

The introduction of a classification has brought with it a rule to the effect that packages containing goods in different sections of the classification will be charged at the rates applicable to the highest class. On the other hand, articles in different classes which form one consignment but are not packed together, are charged separately.

Under the old order, there was a scale of charges applicable to goods sent at company's and owner's risk. The difference between the two often amounted to 50 per cent. or so and was far in excess of the risk involved. Naturally the O.R. scale was much more popular and the bulk of merchandise passed under it. To-day there are scales of "standard" charges, company's risk, and exceptional charges at owner's risk. At one time the intention was to fix standard scales at both company's and owner's risk, but it was decided that the amount of traffic passing under the latter would be too small to justify such a table. Much interest centred upon the exceptional owner's risk schedule which, after considerable negotiation, was maintained at the same level as previously. The table is not of universal application, but contains certain goods only. So far as the electrical industry is affected these may be put down as glass battery cells, bronze ingots, carbon and wax (for dry batteries), dynamos, cable, accumulators, controllers, combined motors and armatures, erinoid, magnetos, and ironclad switches. The difference in charges between the various scales will probably be best understood by taking as example a 40-lb. parcel sent a distance of 100 miles. At the standard scale the carriage amounts to 3s. 9d., at company's risk 4s. 6d., but at the *exceptional* owner's risk scale it is reduced to 2s. 6d. As in the case of goods train traffic, the O.R. scale can only be used if the parcels are accompanied by a signed owner's risk consignment note. It is possible to obviate this troublesome process by signing the general O.R. agreement with the railway company or Railway Clearing House.

In no case does the mileage gradation of the conveyance scale exceed "above 300 miles," but for the company's risk tables "above 200 miles" is the maximum. The operation of this scale means that for carrying a parcel 600 miles the charge is no more than conveying it 301 miles. For small parcels this is often a deciding factor in favour of a passenger train conveyance when compared with goods service charges. At the larger stations, passenger train charges have always included collection and delivery, although no specific amount has been shown in the scales for this. Seeing that goods charges for the most part are now upon a station-to-station basis, it is satisfactory to notice that the revised passenger amounts continue to be "collected-and-delivered" quotations in most cases.

It is often overlooked that for very small packages passenger train charges are cheaper than goods rates. This is due to the previously mentioned chargeable distance of "above 300 miles" together with the insistance of a minimum of 28 lb. for all goods train packages. A possible drawback in some instances is the requirement as to prepayment of carriage in force for passenger consignments, but not applicable to goods train lots.

Westinghouse Electric in Norway.

The Oslo correspondent of the *Financial Times* says that the Westinghouse Electric and Manufacturing Company of America, which already holds a one-third share of the capital of the Norwegian National Industrial Company of Drammen, which produces transformers, has now taken over the entire share capital. The Westinghouse Company will allot a definite quota of its total production to the Norwegian subsidiary, which up to the present has had South Africa and Australia as its principal markets.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Four-phase Transmission.

It is interesting to learn that my old friend and colleague, Capt. W. T. Taylor, considers that the three-phase system, *without* a double circuit, gives the greatest security. (I don't.)

His language, however, is somewhat "cryptic"—particularly his last paragraph. Will he, please, be a bit more explicit, so that we may know where we are?

I agree that there is no gain in (overhead) conductor material, if he compares a plain three-phase with a plain two-phase.

But this is not the whole story!

A. M. Taylor,
Birmingham, *March 2nd*, 1928. *Major, S.O.2.*

I should be sorry if the consideration of the system of transmission described by me in your issue of the 17th ultimo were obscured by an academic discussion on nomenclature. Whether "four-phase," "two-phase," or "quarter-phase" best describes the system is a matter of opinion which was discussed at great length some thirty years ago. I like to call the system "four-phase" because to me this best describes its polyphase symmetry, but if others prefer to call it two-phase—why not? "*De gustibus*" . . . Your correspondents' comments on my proposals do not controvert my arguments.

Major A. M. Taylor refers to his most interesting work on six-phase systems, but that is novel; the system I described is not.

It has not been unusual in the past for a transmission line to be put "out of court" by the breakdown of one conductor; it is a condition which one has come to accept in other systems. Good construction and design make the risk a small one. I think, however, that if Major Taylor will reconsider the four-phase system he will find that even with one conductor out of use a polyphase transmission, though distorted, may be maintained through the remaining three conductors.

"J.A.M." asks for a diagram of connections—may I submit the attached as amongst others which may be adopted?

With Mr. William T. Taylor I must join issue. His dictum that "The best system offering . . . (security of supply) . . . with or without a double circuit is the three-phase system" is unsupported by argument or facts.

The contention put forward in my article is that

(1) the four-phase system is safer and cheaper than a three-phase, three-wire line with pilot wires, or a three-phase "split conductor" or six-wire line without pilot wires.

Are these considerations of cost and safety, in Mr. William T. Taylor's view, "independent of the system itself"?

W. B. Woodhouse,
Engineer and Manager, The Yorkshire Electric Power Co.
Leeds, *March 5th*, 1928.

[The diagrams were received too late for inclusion here; they may be found in our "Notes" pages to-day.—EDS. ELEC. REV.]

Trade from Fairs.

British industry has achieved so noteworthy a victory at our record Fair that I may be pardoned for suggesting that we might look to Europe and overseas for other fields to conquer.

If business men from abroad have found it profitable to visit our Fair, might our own business men not find it equally profitable to mingle in the Fairs of other lands? Yet I find that last year the number of British business men who thought it worth while to see the Swiss Industries Fair at Basle was just—eleven! We were the sixth country in their visiting list, France leading with 679 commercial ambassadors, and Germany coming a close second with 666.

Ought not that sorry record to be improved when the Basle Fair once again opens its doors next month from April 14th-24th? Switzerland is a prosperous country with a large demand for the textiles, machinery, and so on that we could give her; nevertheless I find that, while she does purchase more cotton goods from us than from any of her neighbours, we are beaten in woollen goods by France and Germany; by these countries and by the United States and Italy in machinery, iron, and in total purchases made; for, by a coincidence, we are sixth on the list of countries who visit the Swiss Industries Fair and fifth amongst the nations with whom Switzerland does trade.

London, *March 3rd*, 1928. **Strathspey.**

The Birmingham Fair.

During the period of the Birmingham British Industries Fair I had opportunity to meet quite a number of other exhibitors and customers who expressed a few views which it seems that those responsible for the management might perhaps take into consideration.

First, is it necessary to have the White City Fair and the Birmingham Fair at the same dates? The Birmingham Fair is largely for the hardware, electrical, and heavy industries. These, to a great extent, are not seasonal trades, and this Fair is supposed to be for the special benefit of the export trade. The general opinion was expressed that the date, the end of February, was wholly unsuitable for the purpose of attracting Colonial and South American buyers.

The season at which the general influx of visitors to Great Britain from the Dominions and abroad is at its height, is towards the end of May or beginning of June, and these are the customers whose interest we as exhibitors particularly desire to attract. But at the 1928 Fair, they were largely noticeable by their infrequency.

The opportunities at this Fair to meet potential Empire customers do not seem to be provided by a date in the middle of February.

As regards the home trade, my firm circularised its customers regarding this Fair and received a considerable demand for tickets from ironmongers and the like; in fact, these continued to come in during the Fair. But the system at the door, whereby the admission tickets were taken from the holders, was rather an abuse. The Fair is so big that a customer wishing to examine the exhibits, cannot do so in one day, and he must either have another ticket or pay 2s. 6d. to come a second time. The general admission of the public during the Fair is also a matter on which opinions can be expressed. It means that all price-lists, with discounts to the trade, must be withdrawn, and every visitor to a stand questioned closely as to his business. One or two days should be strictly reserved to the traders, and on these days the public not admitted.

Finally a word as to the railway arrangements. I travelled several times from Euston on the 9.10 express to Birmingham, but there was no through booking to Castle Bromwich, and although extra carriages were put on which could have been attached to the 11.20 train to Castle Bromwich, this was not done in either direction, and the overcrowding of the trains such that at the end of a tiring day many people were reduced to a stage of complete exhaustion.

Yesterday, particularly, I noticed that whenever a chair was placed in a vacant space it was seized by tired visitors. Surely more could be done in this matter as it is a truism to say the more the comfort of a customer is catered for the more chance is there of his paying another visit.

For **Rd. Johnson, Clapham & Morris, Ltd.**
A. L. JOHNSON, *Chairman and Managing Director.*
London, *March 2nd*, 1928.

Shoddy Wiring.

With reference to the correspondence on this subject in recent issues, everyone has missed the real root cause of the trouble.

The real cause is the shoddy prices in the tenders quoted by the contractors, and until these are eliminated shoddy work will continue even by the best workmen with the best will in the world to do their best.

March 2nd, 1928. **Disgusted Wireman.**

The Post Office Tube Railway.

Although this railway has been described in many publications and has had such terms as "First of its kind in the world" (*Times Trade and Engineering Supplement*, February 9th) and "Underground wizardry" (*Times* Weekly Edition, February 16th) applied to it, no indication has been given as to who was its inventor or first proposer. In the absence of such information writers and others are, quite naturally, assuming that the idea originated with the Post Office or one or other of its engineers.

Such, however, is not the case. In 1891 I read a paper entitled "An Electrical Parcel Exchange" at the British Association meeting at Cardiff, in which an underground tube railway with electrical driverless trains was proposed and explained in much detail, the main difference from the present Post Office Tube being that it was not meant to serve Post Office purposes only but to accommodate goods traffic between busy centres in London as well, with the view of mitigating the street congestion that was already in evidence. I indicated the position of my driverless trains in the tunnels and signalled and shunted them by means of track circuits (then, I believe, proposed for the first time), and used rising gradients to reduce momentum on entering stations: anticipating, in fact, practically all the essential devices employed on the Post Office Tube.

My paper was discussed and pronounced practicable by the late Sir Frederick Bramwell, F.R.S., M.Inst.C.E., and the late A. C. Elliott, D.Sc., M.Inst.C.E., then Professor of Engineering at the University of Wales, and others; facts which were reported in *The Times* and other journals.

The paper was published, with diagrams, in the chief engineering and electrical weeklies. A reprint was issued by Chorlton and Knowles, Manchester, in 1891, and that being sold out, a second edition by Whittaker & Co., London, in 1892. Copies of these pamphlets may be seen at the library of the Institution of Electrical Engineers, at the British Museum, and elsewhere. The project was admitted by the Patent Office as an invention and protected by Patents Nos. 12,934 and 13,961 of 1891.

The late Sir William Preece, then Chief Engineer of the Post Office, was a member of the British Association Engineering Committee (Section G), and was present at that Committee

when it accepted my paper. The late Sir John Gavey, who succeeded Sir William as Chief Engineer, was likewise present at the B.A. meeting. The postal officials of the period were not, however, ripe for such an innovation, placing full reliance on their horse-van service to the railway stations; and the fact that such a paper had been read and very widely published and discussed appears to have been forgotten.

Although electric traction was not so fully developed in 1891 as it is in 1928, it was still quite equal to tube railways, and my British Association plans could, without substantial modification, be put into practice to-day. Relief to street vehicular traffic becomes increasingly urgent, and I believe can only be obtained by the connection of the docks, railway depôts, and other congested centres, by an underground system such as I proposed at Cardiff 37 years ago.

Malta, *February 24th*, 1928. **Alfred Rosling Bennett.**

[Mr. Bennett's paper was printed in the Electrical Review of September 4th, 1891, p. 271.—Eds. Elec. Rev.]

Capacitance Current of Super-tension Cables.

In view of the remarks of one of the speakers at the informal discussion on Monday, February 27th, at the Institution of Electrical Engineers, may I be allowed to suggest that capacitance current per mile is *not* the best criterion of efficiency in this respect. Capacitance current per mile *per kVA* is a far better one. On this basis the gain by the reduction of capacitance current, by employing two-phase working, can be shown to be 2.82 times—*viz.*, 1.88 times due to increased load capacity, as I showed last Monday, and 1.50 times due to only four cables being charged instead of six. In other words, we can feed to *nearly three times the distance*, without the capacitance current being the limiting feature. This is very important indeed.

The speaker referred to above did not seem to be aware that the General Electric Co. of America had actually standardised reactors for use on transmission lines, for cancelling the charging current, nor that I had patents which greatly reduce the number and size of these reactor installations, and thus render the question of transmitting power up to 100 miles, by underground cables, no longer anything to be regarded as commercially impossible, or even inefficient, where two-phase transmission is employed.

Incidentally it may be remarked that the lantern slide exhibited did not take cognisance of all that could be done, working on the lines indicated; the result of which is to bring the cost of transmission with underground cables actually down to, or even *below*, that of overhead transmission, with greatly improved security, as is demonstrated in the pamphlet which I enclose. (The writer will be pleased to forward copies of this pamphlet on request.)

Birmingham, *February 28th*, 1928. **A. M. Taylor.**

Domestic Applications of Electricity.

In the report in your issue of February 24th of my reply to the discussion of the above paper at the I.E.E. in London on February 16th, I am quoted as stating "that it was necessary to have separate tariffs in order to prevent trouble from fuses blowing."

I am afraid this is incorrect. The gist of my remarks on this point was that, although, with a 2-part tariff, lighting, heating, cooking, &c. could be registered by only one meter at the service, yet the adoption of such a tariff in most cases did not reduce the cost of the installation to any great extent; the reason being that apart from small portable appliances which can be safely fed from lighting circuits, all heating points should be distinct and separately fused. Otherwise, on a lighting fuse blowing due to a heater being connected to it, a much heavier fuse is usually inserted, with consequent danger to the lighting portion of the circuit.

Birmingham, *February 27th*, 1928. **Reg. H. Rawll.**

Exposed Live Metal Parts.

The following remarks upon the two points raised in your issue of February 10th will, I think, be of interest to many of your readers. As before, I make them with special reference to earth-return systems, and I assume that the precaution mentioned in my letter of the 1st inst. has been duly observed.

Interruption of Return Connection.—I do not consider that there is any undue risk of shock due to the cap becoming live from this cause, as a severance of the return circuit is immediately manifest by the refusal of the filament to light. No workshop electrician and no normal person will handle bulb or wiring, whatever type they may be, when a fault has shown itself, without first either turning off the switch controlling that section of the wiring which includes the faulty section, or in some other way ensuring freedom from risk of shock.

I would point out that the slight danger from this cause is present not only in this type of holder, but also in such apparatus as radiators, cookers, some motors, and all other apparatus where it is possible to touch parts which may be live but which are normally considered dead unless the presence of electricity in these parts is manifest to the senses of sight or of hearing. Danger of shock due to this cause is greatly increased if the apparatus has an earthed casing or frame. Each and all of these risks can only be tolerated because the chance of severance of the return wire is very slight.

Reversal of Polarity.—The danger of the type of holder in question when fitted within normal reach of earthed conductors—*i.e.*, steel girders, concrete floors, and the like—is a real one, and if we omitted to take into consideration the following points it could be termed an unduly grave danger.

A fitting of the type with which we are concerned is rarely, if ever, fitted in a dangerous position except in large factories, workshops, or institutions where a competent electrician is employed. There is no excuse for a competent electrician to change over the feed to a screw-cap holder and so, except in a very few cases, the chance of reversal of polarity by an electrician under dangerous circumstances is negligible.

If a supply undertaking reverses the polarity of its mains without also reversing the service connections, it is guilty of breaking the most important rule for freedom from shock in normal electrical apparatus; the rule that all switches controlling any electrical apparatus shall be inserted in the feed wire and never only in the return wire. An offence of this magnitude causing widespread risk of shock is unpardonable. This chance is, I believe, quite small, and will become smaller as distribution by three-phase four-core cable progresses.

Thousands of electrical appliances, controlled by switches mounted thereon, are in use at the present day with either reversible plugs, or non-reversible plugs fitted to the flex, without any consideration as to which wire goes to the switch on the appliance. In most of these cases there is a very real danger of shock because most of the people using them think that because the switch on the appliance is in the off position the appliance is free from risk of shock.

It would thus seem that to be free from risk of shock from all electrical apparatus, be it radiator or light or motor or any other appliance, it is necessary that at least the switch or switches nearest to the electrical portion of the appliance which has or which have an off position controlling the whole or separate sections of the appliance shall be of a type breaking all leads to that appliance or to each separate section of that appliance. Present normal practice differs from this, as it is considered sufficient to break that number of leads which are supposed to be live.

Harrogate, *February 22nd*, 1928. **H. G. Batson.**

[This letter has been shortened. We place no reliance on the permanency of polarity, and wiremen do not always put the switch on the live side in the first instance. It is best to avoid the use of exposed metal forming part of the circuit.—Eds. Elec. Rev.]

"Fair Trading."

One hears of endeavours in many sections of the electrical industry to define "fair trading" and to make the definition binding on those concerned. Some views on a possible scheme of interworking between manufacturers, wholesalers, contractors, and retailers are here submitted, and apply particularly to supplies for installation work.

First, it seems quite clear that without reasonable assured profits manufacturers cannot afford such research and re-equipment as will enable them to sell any stated product at a lower price, an improved product at the present price, or perhaps ultimately an improved product at a lower price.

For the purpose of this communication manufacturers are divided arbitrarily into two classes:—

(*a*) Those who maintain their individual selling terms and prices to the contractor and retailer and impose similar re-selling terms and prices on the wholesaler.

(*b*) Those who sell their products promiscuously and take no interest in subsequent re-sales.

Reference hereafter will be made to these two classes.

The expansion of stocking and distributing facilities by the wholesalers must depend to a large extent on their having reasonable assured profits. If all manufacturers were in Class (*a*) the individual wholesaler would be immune from unfair competition by the manufacturer concerned, and by other wholesalers, for any stated product. Support of the (*b*) class obviously secures no such immunity, and often leads to a profit-cutting "war" among the wholesalers.

Contractors (and retailers) similarly need profits to enable them, among other things, to expand their facilities for popularising the use of electricity. At first sight the purchase of an article at lower than normal price may seem good business, but when it is realised that competing contractors may get not a similar, but the same, article at even a lower price from either a (*b*) class manufacturer or the wholesalers who deal with him, it becomes evident that such trading is ultimately conducive to more profit-cutting and an absence of any sense of security.

Taking the foregoing into consideration, the suggestion is submitted seriously that, other things being equal, a large measure of "fair trading" could be assured by all manufacturers being in the (*a*) class; or, alternatively, by wholesalers and contractors dealing only in the products of (*a*) class manufacturers. By so doing, a fair profit would be assured to all concerned, and should result in better and cheaper products, increased stocking and distributing facilities, and the expansion of facilities for popularising electricity.

There remains, perhaps, the definition of "manufacturer," "wholesaler," "contractor," and "retailer," but this should be capable of settlement by the representative trade associations concerned.

London, *February 27th*, 1928. **Manolescon.**

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The E.D.A. Circle Campaign.

Demonstration all-electric houses are being opened at Eston and Blackpool in connection with the campaign, and electrical exhibitions are being held at Colchester and Clayton.

We have received from the North-East Area Committee a list of lectures which Miss Anna Holm is giving to a number of branches of the Women's Co-operative Guild in the Carlton House lecture theatre, Newcastle. These cover the domestic uses of electricity in general and cooking in particular.

Brookhirst Benevolence.

At the eighth annual meeting of the Brookhirst Benevolent Fund, recently, it was reported that during the comparatively short period this fund has been in operation the members have subscribed £1,123, and the aggregate of the yearly donations made to the fund by the company totalled £650. Sickness benefits amounting to £688 and death benefits of £331 have been paid. The assets at the end of the financial year totalled £829. Mr. A. H. Cartwright was elected chairman.

The Work of the Newcastle Co.

Mr. R. P. Sloan, chairman and managing director of the Newcastle-upon-Tyne Electric Supply Co., Ltd., was the guest of the Middlesbrough Chamber of Commerce at a recent luncheon. In the course of an account of the undertaking, Mr. Sloan said that there were divergent views as to the merits of large combinations in industry, but those who had studied the subject were generally agreed that in an industry such as the electrical industry, combination was very advisable. It was exemplified, he thought, in the case of their undertakings, which had grown from very small beginnings, and now represented the largest group of electrical supply in the country. There was no district in the world where the development of electricity had been carried out to such a great extent as in North-East England. It was true that there were larger undertakings, but there was certainly none where the consumption of electricity per square mile for a large area would compare with it. The company had either done, or was doing, virtually all that the Electricity (Supply) Act contemplated should be done. It was true that the company's system was not linked up with systems to the north or south, but the mere interlinking of power stations could not in itself have any marked effect on production costs. Personally, Mr. Sloan said, he had never believed that the operation of the Act would result in a cheaper and more abundant supply.

Czecho-Slovakian Extensions.

Following upon the purchase last year of the factory of Barthelmus, Donat & Co., the Skoda Co., of Pilsen has lately made a further extension of its operations in Moravia by acquiring the works of Schwarz & Co., of Brünn. It is understood that the Skoda Co. is to lay down plant for electrical engineering products, and that the new works will give employment to some 1,000 workers. In addition to a large contract recently secured for the supply of plant for one of the Shanghai power stations, representatives of the Skoda Works are reported to be in negotiation in Paris and London in connection with other overseas contracts.

Local Exhibitions.

Derby.—The Corporation Electricity Department and electrical traders formed the strongest group in the Home, Industry and Fashion Fair held in the Derby Drill Hall recently. The whole of one side of the large hall was taken up by a display arranged by the Corporation.

Mr. W. L. Webb, the Electricity Department's sales manager, designed the row of stalls. Each compartment had its appropriate colour scheme. The whole was lighted by "Siemens" pendants, chosen in accord with the contents of each compartment. A very fine range of domestic apparatus was shown as a result of co-operation between the Derby Corporation and the manufacturers. Three hundred yards of coloured strip lighting were placed in adjacent streets, as the hall occupies a not very prominent site. A searchlight on the roof, provided by the London Electric Firm (Croydon), proved an effective device. In addition to the municipal section the following firms had stands: Messrs. Taylor & Briggs, R. Egerton & Co., Hulme & Son, Taylor, Whiting & Taylor, Jerram & Co., Ltd., Jolley & Cowlishaw, Batterby & Hefford, and Ernest Jones & Co., Leeds.

Barnsley.—A successful electrical exhibition was held at Barnsley from February 22nd to 28th. The attendance at the exhibition was 35,000. Cookery lectures and demonstrations were given to 2,437 people who attended the 25 sessions, and 3,327 were admitted to the sessions for the display of kinema films showing the uses of electricity.

Recent Contracts.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., have received an important rural electrification contract for a h.p. feeder in the form of underground cables and overhead lines to supply the towns of Saxmundham, Wickham Market, Melton, Orford, and Hollesley from the Ipswich mains. The contract also covers the installation of the underground and overhead low-pressure distribution cables in these five towns, which will now very soon be linked up electrically with Ipswich, as well as the house service cables and sub-station switchgear.

Messrs. Peters, Ltd., have recently completed for the Old Delabole Slate Co., Ltd., whose quarries in Cornwall are said to have been worked for the past 400 years, a 250-b.h.p. two-stroke engine, direct-coupled to a generator which will supply lighting and power for the quarries.

The London Electric Firm (Croydon) has recently secured an order for some searchlights, about 7 ft. in diameter. These are claimed to be larger than have hitherto been constructed in this country, and amongst the largest ever made in any country. In addition, the firm is engaged on naval and other searchlights (including high-intensity types) for the Home and foreign Governments.

The English Electric Co., Ltd., has secured through its agents, the Associated British Manufacturers (Egypt), Ltd., an important contract from the Egyptian Ministry of Public Works. This contract, which amounts to about £185,000, is for the complete plant for the Belqas power station, and includes three 2,500-kW turbo-alternators, the necessary transformers, switchgear, &c., boiler plant, and coal-handling plant. The station is to supply power for the operation of the new pumping stations in connection with the Egyptian Government's irrigation schemes, &c.

The Revised Standard Building Contract.

Under the auspices of the Builders' Merchants' Alliance, Ltd., a meeting of representatives of associations affected by the revised form of contract drawn up by the Royal Institute of British Architects and the National Federation of Building Trades' Employers was held on February 27 to consider the proposals. Among the organisations represented were the Cable Makers' Association (Mr. S. J. Benham), the Electrical Contractors' Association (Mr. R. Grierson), the Federation of British Industries (Messrs. C. Tennyson and W. M. Borrodaile), the General Electric Co., Ltd. (Mr. E. G. Batt), Medway's Safety Lift Co., Ltd., &c. The chairman (Mr. T. A. McIntyre) said that as a result of the protests which had been made, the R.I.B.A. had postponed further consideration of the new model form. Resolutions were passed objecting to the form on the grounds that it provided, in effect, that any sub-contractor and/or supplier of goods for which prime cost items or provisional sums were included in the specification or bills of quantities must enter into a sub-contract, one of the terms of which was that no money should be due to him from the contractor until the contractor had himself been paid by the employer. Also it included no provision under which the employer could pay directly to sub-contractors amounts specified by the architect. It was also resolved that firms which merely supplied and did not install goods should not be subject to the terms and conditions applicable to sub-contractors who supplied and fixed their materials under the terms of the sub-contract. The R.I.B.A. and the National Federation of Building Trades Employers were asked to receive a deputation on the subject, which was appointed at the meeting.

The Joint Industrial Conference.

According to the Labour Correspondent of the *Financial Times*, the General Council of the Trade Union Congress has decided to introduce the following matters for discussion at the "unofficial" industrial conference which meets again on March 21st: Trade union recognition and victimisation of workers; collective bargaining through accredited trade unions; participation of labour in the benefits of increased production; minimum wage principles; organisation, technique and control of industry; technical education of workers; and industrial finance, including banking and credit systems and policy.

Trade Announcements.

Messrs. Walker, Crosweller & Co., 54-58, Queen Elizabeth Street, S.E.1, have taken over the sole selling rights for the British Isles and certain countries abroad of the "Dielectrimeter," a portable instrument for testing the dielectric strength of oils, hitherto sold by the Empson Electrical Engineering Co., Ltd.

Messrs. Chas. F. Munn & Co., electrical contractors, have removed from Soho Street to 44, Praed Street, Paddington, W.2.

Messrs. Pickvance, Ltd., wholesale dealers in electrical supplies, of Wrexham, have removed their business to larger premises at 17, Egerton Street.

The Glasgow branch of the Macintosh Cable Co., Ltd., has been removed to 76, Milton Street, Glasgow, C.4. (Telephone: Douglas 4609.)

Messrs. Halsey, electricians, of Stratford, E., have opened new premises at 6, Southchurch Road, Southend-on-Sea.

Messrs. Richter & Pickis, 6, Crescent, Minories, E.C.3, inform us that the cable-laying machine described in our issue of February 24th is made by the Weserhütte A.-G., Bad Oeynhausen, which company they represent for the British Empire.

New Catalogues and Lists.

Messrs. C. A. Vandervell & Co., Ltd., Acton, W.3.—A pamphlet and small posters advertising the company's new all-moulded h.t. radio battery.

The Hart Accumulator Co., Ltd., Marshgate Lane, Stratford, E.15.—A showcard advertising the company's "Comparto" h.t. radio accumulator.

Messrs. J. G. Statter & Co., Queen Anne's Chambers, Westminster, S.W.1.—A March calendar-blotter advertising the company's switchgear.

Pope's Electric Lamp Co., Ltd., 5, Arthur Street, New Oxford Street, W.C.2.—A March calendar-blotter advertising "Elasta" lamps.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—An illustrated leaflet advertising a special cabinet for the display of the company's automobile lamps.

Messrs. Mavor & Coulson, Ltd., 47, Broad Street, Mile End, Glasgow.—March calendar-blotter advertising "M & C." shaker-conveyor troughs.

The Electrical Equipment & Carbon Co., Ltd., 107-111, New Oxford Street, W.C.1.—A booklet describing the selective line protection system of the Dr. Paul Meyer A.-G.

The General Chemical & Pharmaceutical Co., Ltd., Willesden, N.W.10.—A catalogue of "Judex" analytical reagents and laboratory chemicals. Fully priced.

Bankruptcy Proceedings.

E. Shaw, electrician, 11, Albion Street, Huddersfield.—Receiving order made February 24th, on debtor's own petition. First meeting March 9th; public examination April 18th, both at the County Court House, Huddersfield.

J. H. Gordon, electrical engineer, 21, Leeds Road, Ilkley.—Receiving order made February 22nd, on debtor's own petition. First meeting March 12th, at the Official Receiver's office, 24, Lower Bond Street, Leeds; public examination March 27th, at the County Court House, Leeds.

R. M. Collier, electrician and electrical contractor, 138, Ashton Road, Oldham.—Receiving order made February 22nd, on debtor's own petition.

A. C. Cooper, electrical engineer, 1a, Sherwood Street.—Receiving order made February 24th, on debtor's own petition.

H. D. Douglas (H. D. Douglas & Co.), engineer, contractor, wireless factor, &c., 42, Bromley Road, Catford, S.E., and 32, Queen Victoria Street, E.C.—Last day for proofs for dividend, March 14th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

E. R. H. Symonds, electrician, 40, Victoria Road, Great Yarmouth.—Last day for proofs for dividend, March 14th. Trustee, Mr. C. B. L. Prior, Official Receiver, 9, Queen Street Chambers, Norwich.

J. S. Rhodes, electrical engineer, 102, Morley Street, and 74, Horton Lane, Bradford.—First and final dividend of 2½d. in the £ payable at the Official Receiver's office, 12, Duke Street, Bradford.

London Fan & Motor Co., electrical engineers, 81, Charlotte Street, Tottenham Court Road, W.1.—Receiving order made February 22nd, on a creditor's petition.

Company Liquidations.

Notable Electric Co., Ltd., 21, Waterloo Road, S.E.—The statutory first meetings of the creditors and shareholders were held on February 29th at Carey Street, W.C., before Mr. J. Barwick Thompson, Official Receiver. The winding up order was made on the petition of M. Dunn, Ltd., moneylenders. The chairman reported that a statement of affairs had been lodged showing liabilities of £2,279, assets *nil*, and a deficiency of £7,279, with regard to contributories, the issued capital being £5,000. The company was registered as a private company in September, 1916, to acquire and take over as a going concern a business carried on at 30, Margaret Street, W., under the style of the Notable Electric Company, and to carry on business as manufacturers of and dealers in electric lamps. The promoters were W. J. Owen and F. Warner; the former acted as managing director until March, 1917, when the latter succeeded him. The business taken over was stated to have been in existence only a few months, and to have included a small quantity of electric lamps and fittings; the purchase price was the nominal sum of £100, but 4,900 shares were allotted for the factory, equipment, machinery, stock, &c., also taken over. The company was continually in need of financial assistance, which was furnished by Mr. Warner. The trading was carried on at a loss throughout, the accounts showing a total loss of between £7,000 and £8,000. In August, 1925, the director disposed of the stock, plant, goodwill, &c., to another company, the consideration being £9,500, payable as to £2,000 in cash and the balance in shares, and after the sale the company's business practically ceased. All the liabilities were discharged, with the exception of certain bills given in consideration of goods supplied, and the balance of a loan account due to Mr. Warner. The failure of the company was attributed to inexperience at the commencement in the making of electric lamps; to difficulties in obtaining materials except from members of the Electric Lamp Manufacturers' Association; to the fact that employés were continually leaving after they had been trained and become competent; to keen competition by larger firms, and to heavy overhead charges. The liquidation was left in the hands of the Official Receiver.

Kye, Ltd.—A compulsory winding-up order was made against this company by Mr. Justice Eve on March 5th.

Private Arrangements.

Palmer & Edwards, electrical engineers, Andover, Hants.—A meeting of creditors was held recently, when a statement of affairs was presented which showed liabilities of £2,101 and assets of £555, leaving a deficiency of £1,546. It was stated that the cash creditors' claims would be postponed. The business had been managed by Mr. Palmer. About three weeks before the meeting the Sheriff levied execution, and Mr. Edwards then raised over £200 to pay out the execution. The debtors commenced trading in partnership in December, 1925, the capital being £70 contributed in equal shares. It was arranged that the profits should be shared equally after Mr. Palmer had drawn £3 per week for managing the business and 2½ per cent. commission. Early in 1926 the shortage of capital began to make itself felt, and Mr. Edwards, who had been associated with another business, lent £200 to the firm. The accounts at December, 1926, showed a profit before allowing for the drawings. During the last 12 months the turnover had been approximately £2,400, and Mr. Edwards had never drawn anything from the business. It was agreed that the debtors should execute a deed of composition providing for the payment of 7s. 6d. in the £, as to 1s. 6d. in one month, and the balance by instalments spread over a year. Mr. E. H. Hawkins, of Messrs. Poppleton, Appleby & Hawkins, 4, Charterhouse Square, E.C., was appointed trustee with a committee of five of the principal creditors.

Unemployment.

The total number of registered unemployed on February 20th was 1,136,700, a reduction of 23,070, as compared with February 13th, and of 59,360 in comparison with February 21st, 1927.

Metropolitan-Vickers Long-Service Association.

The sixth annual meeting of this Association was held in the Staff Canteen at the Trafford Park Works on February 27th. The chair was occupied by Major-General Sir Philip A. M. Nash, K.C.M.G., C.B., who was subsequently elected president of the Association. The proceedings began with a supper served by the canteen staff. A business meeting followed, at which certain alterations in the rules were made, and the election of officers took place. After this there was a concert, when most items were provided by the M.-V. Orchestra and the M.-V. Male Voice Choir. Community singing, led by a combination of both these musical associations, was very popular. A vote of thanks to the chairman was proposed by Mr. J. S. Peck, and one to the entertainers by Mr. G. E. Bailey. The membership of the Association can only be acquired by those who have served the company or its associated concerns for a period of 20 years, and it is worthy of note that one in every 14 of the people at present employed is a member. When the Association began in 1923, it had 302 members at the annual general meeting. In 1924 this had increased to 405, in 1925 to 509, in 1926 to 651, in 1927 to 779, and this year to 862. There are now 28 women members, five cases where father and son are members, two cases where husbands and wives are members, and one case where a brother and sister are members. At the end of the past year Mr. G. E. Bailey, director, qualified for membership, having served the firm in positions of gradually increasing responsibility till in 1927, when, as general manager of works, he was given a seat on the board. Sir Arthur Whitten Brown, who made the first Atlantic flight with Sir James Alcock, qualified for membership a few days later than Mr. Bailey. At present he is the company's manager in the Swansea district. The M.-V. service seems to be conspicuous for the fact that so large a percentage of its workpeople and staff have remained with the company almost since its foundation.

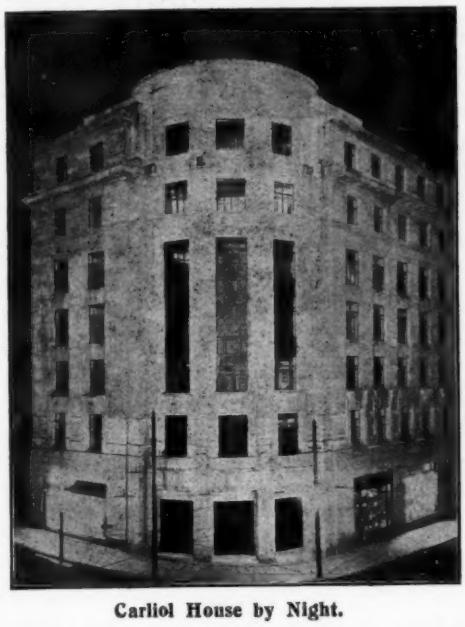
Reduced Australian Duty on Domestic Appliances.

Mr. WALTER RICHARDS, general manager of the Electrical Federation (Victoria), informs us that as the result of an application by the Federation to the Tariff Board requesting a reduction in Customs duties on certain domestic electrical appliances, Parliament has now ratified the following alterations in duties:—

	Old duty.		New duty.	
	British.	Other countries.	British.	Other countries.
Fans	27½%	40%	Free	25%
Floor polishers	45%	60%	,,	25%
Ironing machines ...	45%	60%	,,	25%
Dishwashing machines	45%	60%	,,	25%
Hair dryers	27½%	40%	,,	25%
Clothes washing machines	No alteration.			

The Floodlighting of Carliol House.

We have already published an illustration of the new headquarters of the Newcastle-upon-Tyne Electric Supply Co., Ltd.—Carliol House. We now reproduce a night view sent us by the British Thomson-Houston Co., Ltd., which has supplied equipment for floodlighting the building; the scheme was actually carried out by the Supply Company's own engineers. There is a battery of twelve projectors each fitted with a 1,000-W "Mazda" lamp. The projectors are installed on the cornice of a building diagonally opposite to Carliol House, and it is claimed that the effect can be seen at a distance of five miles from the city. Over the entrances of the building three special bronze lanterns supplied by the B.T.-H Co. have been erected.



Carliol House by Night.

Transformers for the Central Scotland Scheme.

It was announced last week that the Central Electricity Board had placed the contracts for the transformers required in connection with the Central Scotland Electricity Scheme. Three companies share the total of £250,000—Ferranti, Ltd., £130,000; Metropolitan-Vickers Electrical Co., Ltd., £120,000; and the English Electric Co., Ltd., £60,000. The Metropolitan-Vickers Co. informs us that the contract which it has received covers the whole of the present requirements of the two largest sizes. The total capacity of the transformers is 375,000 kVA. The equipments are for large outdoor sub-stations on the 132,000-V transmission system. Each equipment will include self-contained regulating gear for voltage control. The distribution of the groups will be as follows:—Dalmarnock, two 75,000-kVA groups; Edinburgh, two 45,000-kVA groups; Paisley, two 45,000-kVA groups; and Port Dundas, one 45,000-kVA group. The units of the 75,000-kVA groups are each of 25,000 kVA capacity, said to be the largest size of single-phase units ever ordered in this country. The company also claims that the only British power apparatus which has yet been manufactured for 132,000 V is that which was supplied by it to the Victoria Falls and Transvaal Power Company.

Social Events.

The annual meeting and social evening of the Bradford Corporation Electricity Department Social and Welfare Club took place on the evening of February 24th, at the Osborne Hotel, under the presidency of Mr. T. Roles, city electrical engineer. Alderman W. Turner, chairman of the Electricity Committee, was elected hon. president; Alderman J. W. Longley (deputy-chairman of the Committee), hon. vice-president; and Mr. T. Roles was re-elected active president. After the business, musical items were rendered by various members of the staff.

On February 29th the Leatherhead Electricity Company's Staff Sports Club and friends held their second social and dance of the season at the Victoria Hall, Leatherhead. Mrs. Hollidge and Miss Hardy rendered songs and Mr. Chapman played the violin. The chairman of the club, Mr. G. W. F. Horner, enlivened the proceedings with a special Leap Year competition. The secretary of the Club thanked on behalf of the members, Mrs. Birch, Miss L. Skilton, and Mr. H. Ottway for providing the music. Mr. H. Birch and Mr. C. J. Clark conducted the competitions and Miss G. Smith and Mr. H. F. Brown looked after the catering.

The staff of the Cardiff Electricity Department held its annual dinner at the Grand Hotel, Cardiff, on March 2nd, the city electrical engineer, Mr. C. G. Morley New, presiding over a large company. Mr. Arthur Ellis, proposing the toast of the Department, said that they had been spending £100,000 per annum for the past seven years, and there was no indication of any relief being required from the rates. They were coupling up new consumers at the rate of 375 per month, and had adopted a system of assisted wiring necessitating an expenditure of £1,000 per month. The Department had decided to open showrooms. There was no competition with the contractors; there had always existed a spirit of goodwill and co-operation. Councillor A. E. Gough, chairman of the Electricity Committee, replied to the toast, and Capt. S. B. Haslam paid a tribute to the work done by Mr. Morley New. During the evening the chairman, on behalf of the staff, presented Mr. Edgar Jones, mains superintendent, with a handsome cabinet gramophone on his retirement after 35 years' service.

The accompanying picture shows a happy group at the Henley Head Office Social Club Fancy Dress Dance, held at the Cripplegate Institute on February 24th. Mr. Percy Rosling, the general manager of the W. T. Henley's Telegraph Works Co., Ltd., is seen to the right of the centre of the group; he is wearing a white waistcoat. Mrs. Rosling is on his right. The next effort by the Henley Amateur Dramatic Society will be the "crook" play, "Leah Kleschna," which will be staged at the Cripplegate Institute on March 14th.

The Henley Social Club Dance.

The third dance of the season of the Pirelli-General Cable Works Social and Sports Club was held at the Club Hall, Southampton, on February 24th. Among those present were Mr. G. Martinez (director and general manager), chairman of the Club; Mr. A. E. Greenhill, vice-chairman, and Mr. Werren, besides several heads of departments. Music was supplied by the "Ariste" Orchestra, and the duties of M.C. were carried out by Mr. A. C. Woodley, the secretary, with the assistance of Messrs. Hale and Wyeth. The second of a series of whist drives was also held at the Club Hall on March 1st.

Book Notices.

"The 'Via Marconi' Telegraph Services" (32 pp., ill.). London: Marconi's Wireless Telegraph Co., Ltd.—This booklet describes in a very interesting manner the methods of dealing with radio-telegrams, including a brief description of the "beam" system.

"Manuel du Mecanicien-Electricien," by H. de Graffigny. Pp. 225; 88 figs. Paris: Gauthier-Villars & Co. Price 15 fr.

Scientific Papers of the U.S.A. Bureau of Standards. No. 564, "Absolute Measurement of Capacitance by Maxwell's Method" (15 cents); No. 566, "Indeterminateness of Electrical Charge" (5 cents).

Russian Purchases in America.

According to *Commerce Reports*, the "Amtorg," a Russian Government trading concern in New York, placed orders for the following goods, *inter alia*, during 1927:—Equipment for the electrotechnical industry, $564,534; telephone and telegraph equipment, $13,022; and equipment for the Dniepr hydro-electric plant, $685,687.

The Contractors' Convention.

The third annual conference of the E.C.A. Allied Associations is to be held at Cheltenham on July 4th, 5th, and 6th.

Engineering Luncheon.

The monthly luncheon meeting of the Council and members of the British Engineers' Association was held yesterday, March 8th, at St. Ermin's Restaurant, Westminster, S.W.1, when Mr. H. G. Williams, M.P., Parliamentary Secretary to the Board of Trade, was to speak on "Imperial Standardisation and Economy as Affecting Employment in the Engineering Industry."

For Sale.

Bury Corporation Electricity Committee invites offers for one 2,000-kW turbo-alternator and condensing plant, and two water-tube boilers. Erith U.D.C. Electricity Department has for disposal generating plant. The Rushden and District Electric Supply Co., Ltd., has for disposal three 240-b.h.p. Willans Diesel engines coupled to 160-kW E.C.C. shunt wound dynamos, with oil tanks, pumps, pipes, exhaust silencers, outside oil storage tanks, one Garrett Locomobile type power plant, boiler superheater and condenser, direct coupled to 115-kW Phœnix dynamo, with steel chimney. Wellingborough Electric Supply Co., Ltd., invites offers for four generating sets, one balancer booster, two Babcock & Wilcox boilers with chain grate stokers, feed pumps, &c. (See our advertisement pages to-day.)

Australian Electrical Imports.

The official statistics of imports for the four-month period July-October, 1927, show that, although there was a small decrease in the total, electrical machinery advanced by £265,000.

Continental Cable Development.

The Krizik Co., Prague, and the Felten & Guilleaume Cable Co., Vienna and Budapest, are reported to have lately acquired an interest in the Polish Cable Co., Bydgoscz.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.		Price Mar. 6th.	Fortnight's inc. or dec.
a	Acid, Oxalic	per lb.	5½d.	...
a	Ammoniac, Sal	per ton.	£60	...
a	Ammonia, Muriate (large crystal)	,,	£52	...
a	Bisulphide of Carbon	,,	...	...
a	Borax	,,	£25	...
a	Copper Sulphate	,,	£25 10s.	...
a	Potash, Chlorate	per lb.	3½d. to 4d.	...
a	,, Perchlorate	,,	5½d.	...
a	Shellac	per cwt.	£13 10s.	...
a	Sulphur, Commercial	,,	£11	...
a	,, Roll	,,	£11	...
a	Soda, Chlorate	per lb.	3d.	...
a	,, Crystals	per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ...	per lb.	3½d.	...
	METALS, &c.			
b	Aluminium, Ingots	per ton.	£105 to £112	...
b	,, Wire	per lb.	1/1 to 1/9	...
b	,, Sheet	,,	1/3 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—			
	Grade I	per ton net.	£210	£3 inc.
	Grade II	,, ,,	£145	£1 inc.
	Grade III	,, ,,	£77	£1 inc.
c	Brass (rolled metal 2' to 12' basis)	per lb.	9¾d.	...
c	,, Tubes (solid drawn)	,,	11¾d. to 1/-	...
c	,, Wire, basis	,,	9¾d.	...
c	Copper Tubes (solid drawn) ...	,,	1/1	...
c	,, Bars (best selected) ...	per ton.	£92	...
c	,, Sheet	,,	£94	...
c	,, Rod	,,	£92	...
d	,, (Electrolytic) Bars ...	,,	£66 12s. 6d.	2/6 dec.
d	,, ,, Sheets ...	,,	£143 10s.	...
d	,, ,, Wire Rods	,,	£76 12s. 6d.	2/6 dec.
d	,, ,, H.C. Wire	per lb.	9¾d.	...
f	Ebonite Rod	,,	2/3 to 2/6	...
f	,, Sheet	,,	2/3 to 2/6	...
n	German Silver Wire	,,	2/2	...
h	Gutta-percha, fine	,,	6/3	...
h	India rubber, Para fine	,,	1/0½	1½d. dec.
l	Iron Pig (Cleveland No. 3.) ...	per ton.	65/-	...
l	,, Wire, galv. No. 8, P.O. qual.	,,	£21	...
g	Lead, English pig	,,	£21 10s.	10s. inc.
g	Mercury	per bot.	£21 7s. 6d. to £21 12s. 6d.	2/6 to 7/6 inc.
e	Mica (in original cases) small ...	per lb.	3d. to 3/-	...
e	,, ,, medium	,,	4/- to 8/-	...
e	,, ,, large ...	,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings	,,	1/3½	...
p	,, ,, drawn bars & rods	,,	1/3	...
p	,, ,, rolled strip & sheet	,,	1/2½	...
p	,, ,, wire...	,,	1/3½	...
e	Platinum	per oz.	£17 15s.	...
d	Silicium Bronze Wire	per lb.	10½d.	...
r	Steel, Magnet, in bars	,,	7½d.	...
n	Tin, Block (English)	per ton.	£232 to £233	£3 10s. to £4 10s. inc.
n	,, Wire, Nos. 1 to 16	per lb.	3/10	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Reporting on March 3rd, Messrs. James Forster & Co. stated that there was still nothing in view to lift the lead market out of its present depression. Low though the price was, it seemed not unlikely that it would fall still further in the near future with conditions as they were at present.

New Municipal Showrooms and Offices.

The Shipley Urban District Council has acquired premises in Westgate for the purpose of a showroom for the electricity department.

The Italian Electric Lamp Industry.

A message from Rome says that various bodies for the safeguarding and encouragement of national industries have urged upon the Minister of National Economy the advisability of examining conditions in the Italian electric lamp industry with the view of discovering to what extent the national industry might be protected against foreign competition.—*Reuter's Trade Service* (Milan).

Changes in Rail Rates.

Although very extensive alterations to railway rates were made at the beginning of the year, there have already been further developments. Distilled water in carboys which is in Class 16 in the ordinary way, is lowered to 13 for truck loads of two tons. The "H" reduction of 12½ per cent. is still available for owner's risk consignments. Ebonite boxes loaded one ton per truck are in Class 16, but in 19 if smaller quantities are forwarded. The difference in charges over a distance of 100 miles at standard rates amounts to 5s. 4d. per ton, so that the possible saving in this instance is appreciable. A reduction of two divisions is made in the instance of tramway point boxes of iron or steel (without fittings) the previous Class 16 being now replaced by 14. Insulated wire comes down from 19 to 18, whilst all the small items covered by the general term of "hardware" benefit by a reduction from Class 18 to 17. The "damageable" conditions are made applicable to unpacked consignments of electric controllers (drum type) of the kind used for traction motors, generator and motor parts, magnetos, transformer coils, and electro-mechanical rail brakes. Electric stoves, heaters, &c., sent in loads of two tons per truck are now allowed a reduction of one class under the modifications. Additions to the classification include induction regulators which are now taken up with machines and machinery. Another addition concerns plumbago and earthenware slabs for electric radiators, with metallic fittings, which are placed in Class 18 when not fitted up. As an amount for covering, &c., is usually included in the rates for goods in Classes 7-21, it is only right that some allowance should be made from the standard rate when goods are sent in *unsheeted* open trucks. This point has now been placed beyond dispute by the introduction of a schedule which allows 3d. per ton for goods in Classes 7-10, 5d. for articles in 11 to 13, and 6d. for those in 14-18. For Class 19, 10d. is the appropriate sum and 1s. is allowed for 20. In individual instances, the extent of saving will naturally be small, but if consistently claimed over an extended period, the amount realised will be well worth the trouble involved.

Lighting and Power

Aberdeen.—Electricity Supply.—The Corporation Electricity Committee has recommended the installation of additional converting plant in sub-stations and the laying of further feeder cables, before the winter of 1928, at a cost of £51,641. Cables are to be laid between the Rubislaw sub-station and Ferryhill at a cost of £20,080.

Aylesbury.—Loans.—The Town Council has applied for sanction to loans amounting to £24,311 for the following purposes:—Meters, £3,000; hired-wiring scheme, £1,500; hire of apparatus, £2,000; mains and services, £14,379; transformers, £2,732; and works switchgear, £700.

Electricity in Bulk.—Luton Town Council has submitted terms for a bulk supply of electricity, and negotiations are to be continued by a small committee.

Barking Town.—Supply to Housing Estate.—At a recent meeting of the Urban District Council Electricity Committee, the electrical engineer reported the result of his inquiries of the tenants on the Eastbury Estate on the basis of the wiring (including lampholders but excluding lamps or shades) being provided and a charge of 6d. per week being made for the maintenance and rental thereof. 88 replies were received, of which 85 were in favour of the scheme and three against. The Committee has recommended that the proposal for the supply of electricity to the estate, including the wiring of the houses and the change of the present gas lighting of the streets to electricity be approved, and that application be made for sanction to a loan in connection therewith, as follows:—Cable and services, £3,500; street lighting, cable and services, and alterations to lamps and fittings, £500.

Barnstaple.—Electricity Extensions.—The Town Council has decided to submit to the Electricity Commissioners a report from Mr. J. H. Rider regarding extensions to the electricity undertaking at a capital expenditure of about £33,000 This includes a 100-kW Diesel engine and generator, a new switchboard, and armoured cables.

Birmingham.—Progress of Supply.—During the month of January, the number of additional consumers connected to the mains was 1,100, representing 1,500 h.p. in power supplies and 15,000 lamps. The Corporation Electricity Committee an-

ticipates being in a position to contribute £31,000 for the relief of the rates.

LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to the borrowing of £10,700 for main transmission lines.

Blackburn.—CONSULTANT'S REPORT.—A special committee has been appointed to report on the suggestions made in the detailed memorandum of Mr. A. H. Dykes regarding the administration of the Electricity Department.

Burnley.—LOAN.—The Town Council has approved a proposal to apply for sanction to borrow £20,000 to defray the cost of several extensions, and the change-over from d.c. to a.c. It is also proposed to dispense with overhead lines in the Higher Brunshaw district, and to extend the h.p. feeders.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—The Manitoba Government has decided upon the creation of a Provincial Hydro-Electric Power Commission to develop the power possibilities of the province and to take charge of its distribution scheme. In preparing the necessary legislation, it is seeking to avail itself of the experience of Ontario after years of successful operation. The Manitoba Government is also desirous of obtaining the temporary services of some of the officials to assist the work of organisation and in the investigation of the water-power resources of the province, which will shortly be undertaken.

Chester.—NEW CHARGES.—The City Council has adopted a new scale of electricity charges for rural areas as follows: A fixed charge of 2s. 6d. per £1 or part of £1 per annum of ratable value of the consumer's premises, and a "unit" charge not exceeding 3d. for the first 10 kWh per quarter per £1, of ratable value of the consumer's premises, and 3d. per kWh for the first 10 kWh per quarter per h.p. of electric motors connected, and 1½d. per kWh for electricity in excess of this amount.

Continental.—POLAND.—The steam-operated power station at Lazista-Gorne, Upper Silesia, which at present comprises three turbo-generators, with a total capacity of 80,500 h.p., is to be enlarged by the installation of two new Brown-Boveri sets of 40,000 kW each and eight 20,000-kVA transformers.

SPAIN.—A 110,000-V transmission line is at present in course of installation by the Sociedad Union Energia Electrica de Cataluna, between Manresa and Vich. At Pont de l'Aigua, near the latter town, a 20,000-kV transformer station is also being established to step down the current—which will be mainly used for traction purposes on a section of the Northern of Spain Railway—to 22,000 V. As soon as the Manresa-Vich line is completed it is proposed to extend it to Gerona, where another transformer station will be established.

RUMANIA.—It is reported from Bucharest that the Council of Ministers has approved a decision of the City Council of Bucharest concerning the establishment by the group formed by the Société d'Entreprises Electro-Mécanique, of Paris, and the Brown-Boveri Company, of Bucharest, of a power station to utilise the falls of the Iafomitza above Moreni, and the construction of a h.p. line connecting the station with the present Ploeshti-Bucharest line. All the works are to be carried out by the group in two years from the date of the contract, and it will control the undertaking for 19 years for the account of the city. At the end of that period the undertaking will become the property of the city.

Croydon.—ELECTRICITY IN BULK.—In connection with the proposed bulk supply of electricity to the Beckenham Urban District Council, the Corporation has received a letter from the London and Home Counties Joint Electricity Authority stating that the Council has agreed to accept a supply of electricity on revised terms discussed between the parties.

Dronfield.—INQUIRY.—The question whether it would be better for the Urban District Council to obtain a supply of electricity from Sheffield Corporation or from the Staveley Coal and Iron Co. was the subject of a recent inquiry held by the Electricity Commissioners. It has been estimated that the capital expenditure would be spread over the first five years. In the first year it would be £12,645, the second year £5,949, the third year £4,654, and £513 in the fourth and fifth, making a total of £24,274. The result of the scheme would be a small deficit for the first two years, and in the third year there would be a profit of £331, increasing to £4,236 by the end of the fifth year.

Eastbourne.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to a loan of £5,600 for transformers and switchgear in connection with the electricity ring main.

East Grinstead.—LOAN.—The Urban District Council is applying for sanction to a loan of £4,500 for mains and services.

Glasgow.—PROGRESS DURING JANUARY.—Under the Corporation Electricity Department scheme, 397 houses were wired in January, making the total to date 6,566. The number of applications for the hire of appliances was 290, making the total 18,639.

Guildford.—ELECTRICITY SUPPLY.—The Corporation has received a request from the Electricity Commissioners to consider the question of the extension of its mains to the extended area of supply under the Guildford Electricity Extension Special Order, 1927, and the consulting engineer has submitted particulars and estimates of capital cost of the transmission system necessary to give a supply of electricity on the new a.c. three-phase system to the Shalford, Bramley, Wonersh, Albury, Shere and Gomshall districts. The estimated capital cost of the scheme is £46,650. The consulting engineer has also reported upon the conference held with the London and Home Counties Joint Electricity Authority with reference to the proposed bulk supply to Dorking and Cranleigh.

Hornsey.—ELECTRICITY SUPPLY.—The Corporation Electricity Committee has decided upon the provision of additional converting plant at the Muswell Hill sub-station at an estimated cost of £6,970, and has authorised mains extensions at a cost of £1,350.

Hull.—SUPPLY TO HOUSING ESTATE.—The Corporation Electricity Committee has arranged with the Housing Committee to lay underground mains for the supply of electricity to 400 new houses on the West Hull Estate at a cost of £11,749.

Ilford.—NEW E.H.P. CABLE.—The Corporation Electricity Committee is to lay an e.h.p. cable from Uphall sub-station to Goodmayes sub-station at a cost of £6,775.

Inverness.—NEW PLANT.—Mr. C. A. Grut, burgh electrical engineer and manager, submitted a report to the last meeting of the Town Council regarding the proposed extension to the electricity undertaking. The estimated cost is as follows:—1,000-kW set with necessary steam and water piping and foundations, £10,000; switchgear, &c., £3,000; cables and sub-station plant for railway and part town supply £5,000; cables and sub-station for Crown and Upper Drummond districts, £5,000; buildings for h.p. transformers and switchgear, £1,000; contingencies, £1,000; total, £25,000. Mr. Grut recommended that Messrs. Geo. Gordon & Co. be asked to prepare plans, &c. The Council is to apply to the Electricity Commissioners for their sanction to the scheme.

Kingston-on-Thames.—ELECTRICITY IN BULK.—The Town Council is to give a supply of electricity in bulk to Walton-on-Thames at £1 per kW of maximum demand per quarter.

Leicester.—LOANS.—The Corporation Electricity Committee is applying for sanction to borrow £20,000 for sub-station requirements (including transformers, switchgear, land and buildings), and £50,000 for mains.

London.—POPLAR.—The Borough Council Electricity Committee has received sanction to borrow £1,451 for mains, transformers and switchgear in connection with the supply to flour mills in Bow Road.

Lytham-St. Annes.—LOAN.—The Corporation is applying for sanction to a loan of £20,000 for mains and services.

Norwich.—NEW PLANT.—The Corporation has approved a scheme for the installation of additional plant at the electricity works. The scheme includes one 12,500-kW turbo-generator and two 40,000-lb boilers at an estimated cost of £104,000, and the installation of an additional 1,500-kW convertor at Duke Street station at an estimated cost of £6,300. The number of consumers is now over 20,000, the last monthly return showing an increase of over 400.

Nuneaton.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £8,000 for electricity extensions.

Preesall.—LOANS SANCTIONED.—The Urban District Council has received sanction to the borrowing of £2,250 for services and motors, and £1,735 for overhead mains.

Price Reductions—Reductions in the charges for electricity have been made or recommended in the following districts:—

DONCASTER.—*The Electrical Distribution of Yorkshire, Ltd.*—Country districts in the company's area of supply: Lighting—5½d. per kWh. Residential tariff—Users for heating and cooking will receive electricity, for additional uses only, at ½d. per kWh.

BINGLEY.—Lighting—A reduction of ½d. per kWh. Power—Flat rate and maximum demand system, a reduction of ½d. per kWh, with further reductions for large quantities.

SALFORD.—Domestic lighting, heating and power, including the supply to the Tramways Department: A reduction of approximately 10 per cent.

SOUTH SHIELDS.—Lighting and domestic purposes: A reduction of ½d. per kWh.

WALLASEY.—Lighting: From 4½d. to 4¼d. per kWh. Power: To small consumers from 2d. to 1½d. per kWh.

YORK.—Lighting: Private residences, from 4½d. to 3½d. per kWh; public buildings, from 3½d. to 3d. per kWh.

LONDON.—*Metropolitan Electric Supply Co., Ltd.*—Mid-London Order: Lighting, from 6d. and 2½d. per kWh to 5d. and 2¼d. Paddington: Lighting, from 6d. and 3½d. per kWh to 5d. and 2½d.

Charing Cross Electricity Supply Co., Ltd.—Lighting: From 6d. and 2¼d. per kWh to 5d. and 2¼d.

Rochdale.—SUPPLY TO HOUSING ESTATE.—The Housing Committee has decided that the new houses to be erected on Nook Farm estate shall be supplied with electricity only. The new houses in Victoria Place are to have both gas and electricity supplies.

Rugby.—New Sub-Station Plant.—The Urban District Council has decided to equip the sub-station in Union Street with a new 2,000-kVA transformer.

Shrewsbury.—New Plant.—The Town Council has decided to install at the electricity works a second 400-kW Diesel set, the second portion of an extension scheme, at an estimated cost of £8,150.

Shipley (Yorks.).—Assisted Wiring Scheme.—The Urban District Council, on February 28th, approved a proposal submitted by the Electricity Committee for installing electric lighting in houses on the easy payment system. The householder will pay £2 down for the service cable up to five yards, with 5s. per yard if in excess of that length, and half-yearly payments according to the number of lighting points. The scheme applies only to private houses in streets in which main cables are already laid, and not to new houses.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by Preston Corporation authorising it to supply electricity in the urban district of Kirkham and parts of the rural districts of Fylde and Garstang; Harrogate Corporation to supply electricity in the urban district of Knaresborough and parts of the rural districts of Pateley Bridge and Great Ouseburn; Ashford Urban District Council to supply in parts of the rural district of East Ashford; and the North Somerset Electric Supply Co,. Ltd., to supply in the rural districts of Langport and Wincanton, and parts of the rural districts of Bath, Frome, Keynsham, and Shepton Mallet.

The Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Silsden Urban District Council to supply electricity in its area and to take over the supply from the Yorkshire Electric Power Co. in the district.

Stoke-on-Trent.—Electricity in Bulk.—At a recent meeting of the Corporation Electricity Committee letters were received from Leek and Stone Urban Districts Councils accepting terms for a bulk supply of electricity, and the borough electrical engineer has been instructed to prepare a report on the necessary equipment for giving such supplies.

Mains Extensions.—The Committee is to lay mains at a cost of £3,700 to supply Pittshill and Basford Hall Estate.

Tiverton.—Electricity Supply.—An extensive rural electricity scheme was outlined by Mr. F. Christy, a representative of the Culm Valley Electric Supply Co., at a meeting of the Rural District Council on February 28th. He said the deletion from the Wessex Bill of Devon and Cornwall had greatly simplified the position in Devon. His company had made application for an Electricity Order. It would take about five years before the scheme was extended to the extreme edges of the area, but the company expected to complete the bulk of the work next year. The company had applied for the whole of the Culmstock rural district and the northern portion of the St. Thomas rural district. That would bring within its range all to the north of Exeter, with the exception of Pinhoe, which was already included in the Exeter Corporation Extension Order. The company had arranged with the Exeter Corporation to bring two heavy feeders to a point a little way north of Cowley Bridge, and these would be extended to Stoke Canon, which would be its main switching station. From Stoke Canon three main h.p. lines would be extended. In order to ensure a continuous service, there would be three separate circuits. Mr. Christy estimated that in five years' time the company would be selling in the area for which it was now applying approximately 2¼ million kWh. The company's scheme would cost about £50,000 for the whole of the area. The charges to consumers would be 10d. per kWh for lighting and 3d. per kWh for the first 40 kWh per quarter for cooking and heating and 1d. per kWh beyond that amount. In Cullompton it would be ½d. per kWh more. Electricity would be transmitted by overhead mains. The Council gave its consent to the Order.

Walton-on-Thames.—Electricity Extensions.—The electrical engineer and manager, Mr. E. A. Anderson, has submitted to the Urban District Council a scheme for the development and extension of the electricity undertaking at an approximate cost of £20,000, the work to be spread over a period of about three years.

Consulting Engineers.—The Council has decided to retain the services of Messrs. Handcock & Dykes as consulting engineers for the electricity undertaking, at a retaining fee of 50 guineas a year, plus a yearly payment of 6½ per cent. upon the total capital outlay during each year, with travelling and other out-of-pocket expenses.

Wessex.—Scheme Withdrawn.—It has been announced that the promoters of the Wessex Electricity Bill have decided not to proceed with it so far as Devon and Cornwall are concerned. The Devon County Council and the majority of the Borough and Urban District Councils in Devon had resolved to oppose the measure, which had aroused the almost unanimous opposition of the local authorities of the two counties.

York.—Loan.—The Corporation Electricity Committee is applying for sanction to a loan of £25,000 for mains and services.

Tramway and Railway Notes.

Bolton.—Abandonment of Tramway.—After a month's experiment of running tramway and motor-omnibus services to Darcy Lever, the Corporation Transport Committee has decided to discontinue the tram service and revert to the 'bus service.

Colne.—Abandonment of Tramway.—The abandonment of Trawden section of the Corporation tramway in favour of 'buses will take place shortly. The Corporation has placed an order for six 26-seater 'buses, at a cost of £7,350, to operate on the route.

Croydon. — New Tramway Track. — Having completed further road widening, the Corporation Tramways Committee has recommended the construction of a double tramway track in High Street, at a cost of £8,000.

Doncaster.—Opposition to Scheme.—The Rural District Council has decided to oppose the proposal of the Rotherham Corporation to run omnibuses and railless cars in the rural district.

Hastings.—Railless Cars.—The Ministry of Transport has approved the use of eight six-wheeled double-deck railless cars on the tramway system for an experimental period of six months.

Ilford.—Track Renewal.—The Corporation Tramways Committee is to proceed with track reconstruction work in the High Road, at a cost of £4,500.

Lancashire.—Proposed Transport Board.—Proposals for the formation of a Tramways and Transport Board to establish through running between various centres were discussed at a conference at the Blackburn Town Hall on March 1st. Representatives of local authorities from Blackburn and surrounding towns, including Burnley, Accrington, Bolton, Preston, Chorley, Wigan, Darwen, Haslingden and Rawtenstall attended. After considerable discussion the conference was adjourned for one month.

Leeds.—Motor Omnibuses.—The Corporation Tramways Department is replacing railless-car services by motor-'buses, and has now decided to introduce 'buses in place of railless cars on the Guiseley-Burley and Guiseley-Otley routes (which continue the railled tramway to Guiseley, so as to cover mid-Wharfedale). It is proposed also to take advantage of Parliamentary powers and run 'buses between Guiseley and the Bradford tramway terminus at Baildon Bridge, Shipley.

London.—Tramway Sidings.—The Middlesex County Highways Committee reports that, in July last, the County Council approved the alteration of the tramway track at Finsbury Park in order to improve the loading facilities for tramway passengers. The scheme generally provides for the construction of a tramway track running northwards, alongside the kerb, at the junction of Seven Sisters Road and Stroud Green Road, to enable passengers to board the cars from the footpath. The L.C.C., which is interested in this tramway, also approved the scheme, and the joint report of the L.C.C. Tramways manager and the county engineer was submitted to the Ministry of Transport. The Ministry has now indicated that it is unable to take a favourable view of the scheme. The Committee is dissatisfied with the decision of the Ministry, and has arranged for the county engineer to confer further with the general ma nager of the L.C.C. Tramways, with the object of making further representations to the Ministry.

Record Train Service.—A record number of 190 trains now pass through the three underground stations at Charing Cross during each rush hour. Oxford Circus Station (Bakerloo and Piccadilly) comes next with 108 trains an hour, and Piccadilly Circus is third, with 100 in the hour. The District Railway holds the record for the number of trains operating hourly on any one section of track, 80 trains an hour being run between Mansion House and Sloane Square during heavy traffic.

Fast M.E.T. Cars.—The London tramcars are claimed to have the highest average speed in the world; on the Metropolitan Electric Tramways this result is due not to high maximum speeds, but to rapid acceleration and deceleration, with the aid of large motors and special brakes. In view of these circumstances the Metropolitan Electric Tramways, Ltd., has adopted a device to notify oncoming traffic that many of the tramways are fitted with eight-wheel brakes; on a number of its cars a white triangle is painted on the dash with the words "eight-wheeled brakes," warning motorists that these cars have special brakes which can pull up the cars very promptly.

Morocco.—Railway Electrification.—The work of electrification having been completed, an electric train service is now in operation on the railway between Casablanca, Rabat, and Salé.

Southern Railway Electrification.—An electric train service will be introduced on March 25th from London Bridge to Purley and the Caterham and Tattenham Corner branches, and from London Bridge to Crystal Palace (low level) *via* Forest Hill. This will complete the first stage of the £3,750,000

central section scheme, on which work has been in progress for the past 18 months. With the completion of all three central section stages early next year, the Southern Railway will have spent £11,500,000 on electrifying 875 track miles (including 125 miles converted from "overhead" to "third rail"). The rolling stock on the new services will include 136 vehicles, made up of 42 three-coach motor units and five two-coach trailer units. The services until June will be temporary, but with the completion of the second stage in June next the full services will be provided. The second stage, which will begin to operate in June, consists of a further 79 miles of track, about half of which will be conversion from the overhead to the third-rail system of electric traction. The third and final stage of the present central section scheme (63 miles of track)—between Victoria and Epsom *via* Mitcham Junction, London Bridge and Dorking North (*via* Mitcham Junction), and between the City and Wimbledon *via* Herne Hill, Tulse Hill and Tooting Junction—will be completed early next year, and the Victoria to Crystal Palace services will then be extended to Beckenham Junction.

Telegraph and Telephone Notes.

Cable v. Radio-Telegraphy.—AN AMERICAN VIEW.—While the cable *versus* radio controversy continues to attract attention on this side of the Atlantic, it is interesting to note the views of important American interests on this subject. The *Financial News* reports that at the recent general meeting of the Mackay Companies, the president, Mr. Clarence H. Mackay, drew attention to the important extensions to the radio services acquired by that cable company during the past year, and the active entry of the company into the wireless field at an early date. He referred, says the Montreal *Financial Times*, to the acquisition of the Federal Telegraph Co., operating a point-to-point system and ship-to-ship service of radio transmission, but emphasised the fact that the entry of the company into the wireless field was not occasioned through any fear of adverse competition from this direction, but by reason of the realisation that the radio can be rendered a most valuable supplement to the wire system. The maximum efficiency in public communication service would be only attained by co-ordinating communication by telegraph, cable, and radio, which included facsimile and photo-electric transmission.

CO-OPERATION NEGOTIATIONS.—The Eastern and Associated Telegraph Companies and Marconi's Wireless Telegraph Co., Ltd., authorise the announcement that their attention has been called to statements appearing in the Press to the effect that a joint report has been agreed between Sir William Plender for the Cable Companies, and Sir Gilbert Garnsey on behalf of the Marconi Company, and that this joint report has been rejected by the Cable Companies. These statements have no foundation; in fact, the negotiations between the respective auditors are still in progress.

Continental Telephony.—ANGLO-FRENCH CABLE.—A new telephone cable between Paris and London was brought into service on March 2nd. It carries 21 conductors and is laid underground on both sides of the Channel.

Submarine Telephone Cable.—SWEDEN-FINLAND.—A *Reuter* message from Cologne states that the contract for making what is described as the longest submarine telephone cable in the world has been secured in open competition by Felten & Guilleaume, of Cologne-Mulheim. The cable is to connect Sweden with Finland, and will consist of 132 miles of sea line and 25 miles of land line in Finland. The respective contributions to the cost are:—Finland, 21 million Fmk. (about £115,000); Sweden, 575,000 kroner (about £32,500). The cable is to be delivered in six and a half months' time, and telephonic communication is expected to be established in October or November.

Telephone and Telegraph Services.—ABERDEEN-LONDON LINE.—It is expected that work will be commenced in May in connection with the construction of an underground telephone and telegraph cable to link up Aberdeen with London and intervening centres. The cable from Aberdeen will extend for approximately 50 miles to Arbroath, where it will be linked up with one from Dundee. About six miles of duct work have been completed from Dundee to Monifieth, to which place a cable is being laid, and advantage is being taken of this work, and ducts for the Dundee-Arbroath cable are being constructed at the same time.

The Telephone Service.—THE BISHOPSGATE EXCHANGE.—The Bishopsgate automatic telephone exchange, the second automatic exchange in London, was opened on March 3rd. The exchange has a capacity of 10,000 lines, but at the outset the number will be less, and the subscribers affected will be fewer than when the change from manual to automatic working was made at the Holborn exchange. It is hoped to open also this year the Western and Sloane automatic exchanges, on which work is now in progress.

NORTH-EAST COAST DEVELOPMENT.—We have received from Mr. J. R. M. Elliott, superintending engineer of the Newcastle-on-Tyne District Telegraph and Telephone Advisory Committee, a copy of his report for the year ended December 31st last. New manual exchanges were opened at Capheaton, Chatton, Holy Island, Low Fell, and Newcastle, and a number of existing exchanges were extended. New telephones installed increased by 1,727, and the number of calls dealt with was 36,954,000. The number of written complaints received was 2.1 per 100,000 calls. In the Middlesbrough area the number of exchanges increased from 72 to 76, and the number of stations from 11,264 to 12,045. The approximate daily average number of originating local calls dealt with in the district was 14,178, as against 11,990 in 1926. The number of effective trunk calls brought to account for the quarter ended December 31st last was 323,552, as against 287,442 for the corresponding period in 1926.

Transatlantic Telephony.—CHARGES REDUCED.—The Postmaster-General has announced that, from March 4th the minimum charge for a telephone call to Canada or the United States of America has been reduced from £15 to £9. The "Report Charge" (which is made in place of the normal charge when a "particular person" call cannot be effected), is £1 (instead of £2). The hours of service have been extended from 12.30 p.m. to 1 a.m. (British time), instead of from 12.30 p.m. to 11 p.m. as previously. In other respects the service arrangements are unchanged. The extension of the service to a number of additional towns in Canada will shortly take place.

Radio Notes.

Australia.—WAVE-LENGTHS.—The *Electrical Engineer of Australia and New Zealand* reports that the Postmaster-General's Department intends to effect a re-allocation of broadcasting wave-lengths. The wave-lengths of Class A stations will not be altered greatly, the tendency being downwards to 300 metres for main stations and to 250 metres for country stations. The Class B stations will be accommodated between 200 and 250 metres.

Broadcasting.—THE BAN ON CONTROVERSY WITHDRAWN.—On March 5th, in the House of Commons, Capt. Fraser asked the Prime Minister whether he could now state what decision had been arrived at by the Government regarding the broadcasting of controversial matter.

Mr. Baldwin said that the Government had reviewed the decision, taken at the time of the constitution of the British Broadcasting Corporation, under which the Corporation had been prohibited from broadcasting: (*a*) Expressions of opinion by the Corporation on matters of public policy, and (*b*) statements involving matters of political, religious or industrial controversy. The Government had decided that the first of those prohibitions, *i.e.*, that on the issue of "Editorial" pronouncements, must be maintained; but that the second should be withdrawn forthwith.

France.—BROADCASTING.—The future of broadcasting in France is still undecided pending a full official inquiry. In the meantime the broadcasting interests are being permitted to continue their activities, though this concession has only been granted after strong protests against the earlier edict that all private broadcasting must cease on February 1st. A Paris correspondent of the *Wireless World* states that official plans provide for the division of the country into eighteen "transmission districts," each served by its own Government station. In Paris, Bordeaux, Grenoble, Lille, Limoges, Lyons, Marseilles, and Toulouse official stations are already in operation. It is expected that each station will eventually have a power of 3 kW.

Germany.—NEW STATION.—The new broadcasting station at Kaiserslautern was inaugurated on February 20th. At present it is limited to a power of 2 kW, but if no interference is caused to French communications, it will be increased to 4 kW. The station works on a wave-length of 204.1 metres, and programmes are relayed from Stuttgart and other stations in the area.

United States.—HIGH-POWERED SHORT-WAVE VALVE.—The New York correspondent of *The Times* reports that engineers of the General Electric Company announced on March 3rd the development of a high-power short-wave wireless valve. The new valve is a vacuum tube 5 in. in diameter and about 2 ft. long. It is set in a wooden cage, surrounded by wires, condensers, and electric meters. It operates as a self-excited oscillator on a six-metre wavelength, and is capable of radiating from 10 to 15 kW of high frequency power, or about 50 times as much as any other short-wave tube has been known to produce. The valve is connected through a coupling system to a copper bar, about 10 ft. long, which is able to radiate into space the full 15 kW generated by the oscillator.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Ashford.—March 12th. Electricity Department. One 600-kW alternator, suitable for direct-coupling to a Diesel engine. (February 24th.)

Australia. — Melbourne. — March 20th. Postmaster-General's Department. Loading coil pots complete with coils. (B.X. 4221.)*

April 10th. Induction coils and registers. (B.X. 4219.)*

April 17th. Telephone transformers. (B.X. 4220.)* Telephone cord weights. (B.X. 4214.)* Telephone switches. (B.X. 4223.)* Accumulator batteries, plates and separators. (B.X. 4193.)*

April 24th. Telephone transmitters and associated parts. (B.X. 4222.)* Cordless switchboards. (B.X. 4218.)* Contact pressure testers. (B.X. 4249.)*

March 21st. City Council. Insulated copper cables and service boxes. (B.X. 4250.)*

Bakewell.—March 24th. Board of Guardians. Electric lighting wiring and accessories at Poor Law Institution. Specification and quantities (deposit £1 1s.) from Mr. A. Hawes, clerk to the Guardians, Union Offices, Bakewell.

Barnes.—Electricity Department. H. and l.p. cables. (March 2nd.)

Bexhill.—March 22nd. Electricity Committee. 11,000 yd. .05 sq. in. 11,000-V cable. (See this issue.)

Blackpool.—March 19th. Electricity Department. E.h.p. feeders, l.p. feeders, distributors, disconnecting pillars, boxes and services. (February 24th.)

Bognor.—March 13th. Urban District Council. Alterations and additions to the electric lighting installation at the Pavilion. (See this issue.)

Bonnyrigg.—March 14th. Town Council. Electrical work for the Housing Scheme. Mr. T. A. Swan, 7, St. Colme Street, Edinburgh.

Brentford.—March 27th. Board of Guardians. Electric lighting and power installation at West Middlesex Hospital. (See this issue.)

Bury.—March 14th. Electricity Department. One 50-ton electrically-driven travelling crane. (See this issue.)

Chesterfield.—March 16th. Electricity Department. One 33,000-V outdoor sub-station, complete with switchgear, transformers, and 6,000-V induction regulators. (March 2nd.)

Dundee.—March 15th. Electricity Department. Steam, feed, blow-off water and drain piping. (February 24th.)

Egypt.—Cairo.—Egyptian State Railways, Telegraphs and Telephones. Chief Inspecting Engineer, Queen Anne's Chambers, Broadway, S.W.1. 3-core h.p. and l.p. armoured cable, transformer, h. and l.p. switchgear. 10,000 metres lead-covered conductor cable.

April 12th. Ministry of the Interior. Diesel engine alternator set for Suez electric light station. (B.X. 4252.)*

Erith.—March 22nd. Electricity Department. H.p. and l.p. cables, joint boxes and accessories. (See this issue.)

India.—March 23rd. South Indian Railway Co., Ltd. L.p. cables and switchgear. (See this issue.)

March 29th. Indian Stores Department, New Delhi. One 70-kW 120-V d.c. steam-driven generating set. (B.X. 4256.)*

Irish Free State.—Dublin.—April 4th. Electricity Supply Board. Erection of overhead electricity distribution mains and services in Celbridge, Kelcock, Maryborough, Maynooth, Mountmellick, Naas, Newbridge, and Rathaugan. (See this issue.)

March 24th. Borough Commissioners. E.h.p. and l.p. cables, cast iron and stoneware troughing section pillars, compound, &c. (March 2nd.)

Kirkcaldy.—March 14th. Fife Education Committee. Electric lighting installations.—At the Buckhaven school additions (sched. 21s.); at the Burntisland Higher Grade school (sched. 21s.); at the Aberhill school additions (sched. 21s.). Mr. G. Sandilands, architect and master of works, Education Offices, Kirkcaldy.

Leeds.—March 13th. Tramways Committee. Materials required during year ending March 31st, 1929, including: Electrical sundries, electrodes, &c. Specification from Mr. W. Chamberlain, general manager and chief engineer, 1, Swinegate.

London.—Metropolitan Asylums Board.—March 21st. General engineering work, including steam plant, steam and condense mains, h.w.s. mains and apparatus, motor drives, &c.; installation of four new Lancashire boilers; installation of new fuel economiser; brickwork settings for four boilers and economiser; installation of electric lighting, power and telephones at Caterham Mental Hospital. (February 24th.)

H.M. Office of Works.—March 14th. Electrical accessories. (March 2nd.)

St. Marylebone.—March 19th. Board of Guardians. Automatic intercommunication telephones at the St. Marylebone Hospital. (March 2nd.)

Islington.—March 13th. Board of Guardians. Six months' electrical supplies. Forms of tender from Mr. A. King, clerk, Guardians' offices, St. John's Road, Upper Holloway, N.

London County Council.—April 16th. E.h.p. switchgear for Greenwich Power Station. (See this issue.)

Maltby.—March 13th. West Riding Education Committee. Electric lighting installation, Special Subjects Centre, Maltby Hill Council school. Specifications from Education Department, County Hall, Wakefield.

Manchester.—March 19th. Electricity Committee. L.p. water pipework and supports, also dismantling of similar pipework at Stuart Street power station. (March 2nd.)

March 26th. L.p. water and oil pipework, &c., for auxiliary services (Section B), Barton power station. (March 2nd.)

March 13th. Tramways Committee. Trucks, motors, controllers for electric tramcars. Specification from Mr. H. Mattinson, general manager and chief engineer, 55, Piccadilly, Manchester.

New Zealand.—Wellington.—April 17th. Post and Telegraph Department. Head receivers. (B.X. 4239.)*

Norwich.—March 26th. Electricity Committee. Erection of 16 miles of 33,000-V overhead line. (See this issue.)

Oldham.—March 12th. Board of Guardians. Electric lamps and fittings for the Union Institution, Rochdale Road. Form of tender from Mr. F. W. Fletcher, clerk to the Guardians, Union Offices.

Rhondda.—March 31st. Electricity Department. Twelve months' supply of meters, cables, joint boxes, compound, cut-outs, &c. (February 24th.)

Rochdale.—March 12th. Town Council. Electric lighting and power installations for 20 houses, Victoria Place site. Particulars from Borough Surveyor, Town Hall.

Stafford.—March 29th. Education Committee. Installation of electric lighting at Brierley Hill, Mill Street Schools, &c., and at the Girls' School, Tamworth. (See this issue.)

Warrington. — March 12th. Electricity Department. Motors and transformers. (February 24th.)

West Bromwich.—March 14th. Board of Guardians. Electric lighting installation at the medical officer's, &c., quarters at Hallam Hospital. Specifications (£2 2s.) from Mr. A. H. Ward, clerk, 22, Lombard Street, West Bromwich.

March 21st. Walsall and West Bromwich Unions Joint Committee. Cables in connection with building extensions at Great Barr Park Colony. (March 2nd.)

West Lothian.—March 31st. Education Authority. Electrical work at the new Technical and Roman Catholic Schools, Bathgate. Specifications (one guinea deposit) from Mr. Blades, executive officer, Education Offices, Bathgate.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Ashby-de-la-Zouch.—Board of Guardians Accepted:—
Installing electric lighting at the Institution (£194).—Kemp Bros. (Coalville).

Belgium.—Municipal authorities of Schaerbeek, Brussels. For 2,000 metres of h.p. armoured cable, offers were received from German, Belgian, French, Czecho-Slovakian, and two British concerns (British Insulated Cables, Ltd., and Callender's Cable & Construction Co., Ltd.). The tenders ranged from 63,600 to 80,500 francs, the lowest offer being that of the Kabelwerk Gesellschaft, of Duisburg, Germany.

Bury (Lancs.).—Infirmary Committee. Accepted:—
Electric lighting installation for the nurses' hostel and extensions (£191).—The Bury Heating and Lighting Co.

Bury St. Edmunds.—The Town Council received the following tenders for a 1,000-kW turbo-generator, complete with condenser and switchgear, travelling crane, and cable and piping :—

British Thomson-Houston Co., Ltd. (Accepted.)	**£7,232**
Brush Electrical Engineering Co., Ltd. ...	5,871
Metropolitan-Vickers Electrical Co., Ltd. ...	6,050
W. H. Allen & Sons, Ltd.	6,912
Peter Brotherhood, Ltd. (steam piping not quoted).	
Belliss & Morcom, Ltd.	7,668
English Electric Co., Ltd.	8,135
C. A. Parsons & Co., Ltd.	9,285

The Council also accepted the tender of the Premier Cooler and Engineering Co., Ltd., for an open-type natural-draught cooling tower at £498.

Cheltenham.—Works Committee. Recommended :—
Electric light fittings.—Edison Swan Electric Co., Ltd. General Electric Co., Ltd., and Sharpe & Fisher, Ltd.

Eastbourne.—Electricity Committee. Accepted :—
Switchgear and transformers (£7,366).—General Electric Co., Ltd.
Transformers (£4,178).—British Electric Transformer Co., Ltd.
Cable (£3,035).—Standard Telephones & Cables, Ltd.
Extension to switchgear (£600).—Ferguson, Pailin, Ltd.
Cable (£7,129).—Craigpark Electric Cable Co., Ltd.

Edinburgh.—Electricity Committee. Accepted:—
Steel work for Portobello power station (£51,970).—Redpath, Brown & Co., Ltd.

Egypt.—CAIRO.—Ministry of Public Works. The English Electric Co., Ltd., through its agents, the Associated British Manufacturers (Egypt), Ltd., has received a contract for the Belgas power station, at £185,000.

Erith.—Urban Council. Accepted:—
Wiring for electric lighting 50 houses (£325) and 76 houses (£430), and for heating installations at 126 houses (£183).—W. Dickinson & Co.

Glasgow.—Tramway Committee. Recommended:—
D.c.c. wire.—London Electric Wire Co. and Smiths, Ltd.
Trolley bushes.—F. Mountford, Ltd., and Birkbys, Ltd.
Electromagnetic brakes for 50 new cars.—Metropolitan-Vickers Electrical Co., Ltd.
Brass tubing.—C. Henderson & Co., Ltd.
Water Committee. Recommended :—
Electrification of the Water Department store and workshop, Sydney Street (£449).—Allan Arthur & Ure.

Hull.—Telephones Committee. Recommended :—
Three drums of cable (£162).—Power & Lighting Cables, Ltd.

With further reference to our note on page 379 of last week's issue, the complete list of tenders considered by the Electricity Committee was as follows :—

Boiler house steel structure—

Foundation Co., Ltd.	£65,000*
Heenan & Froude, Ltd. (Accepted.)	**£79,055**
Babcock & Wilcox, Ltd.	83,475
Stirling Boiler Co., Ltd.	83,475
Tees Side Bridge & Engineering Works, Ltd.	85,496
Horsley Bridge & Engineering Co., Ltd. ...	85,848

* Incomplete.

Five high-pressure water-tube boilers and accessories—

Clarke, Chapman & Co. (Accepted.)	**£168,279**
Stirling Boiler Co., Ltd.	197,380†
Vickers Boiler Co., Ltd.	203,850
Babcock & Wilcox, Ltd.	204,070
Stirling Boiler Co., Ltd.	205,570
John Thompson Water Tube Boilers, Ltd. ...	214,300

† Not to specification.

Coal and ash-handling plant—

Strachan & Henshaw, Ltd.	£12,190*
Underfeed Stoker Co., Ltd.	12,650† / 6,896
Spencer (Melksham), Ltd. (Accepted.) ...	**20,192**
Robert Dempster & Sons, Ltd.	24,090
Edward Bennis & Co., Ltd.	24,272
W. J. Jenkins & Co., Ltd.	24,793
Geo. Robson & Co.	26,342
Stothert & Pitt, Ltd.	26,425
New Conveyor Co., Ltd.	27,292
Vickers Boiler Co., Ltd.	29,175
Stirling Boiler Co., Ltd.	29,175
Babcock & Wilcox, Ltd.	29,175
Fraser & Chalmers Engineering Works ...	33,292

*Incomplete.
†Not to specification.

Mercury vapour static converting plant for Albion Street sub-station (£3,362).—Hewittic Electric Co., Ltd.
Four motor convertors (£2,533 each).—Bruce Peebles and Co., Ltd.

Ilford.—Electricity Committee. Recommended:—
Automatic switchgear for 1,000-kW rotary convertor and transformer, including removal from Ley Street works to Goodmayes sub-station (£2,570).—Crompton-Parkinson, Ltd.

Tramways Committee. Recommended :—
210 tons of tram rails (£10 16s. 6d. per ton); 250 pairs fishplates (£14 10s. 6d. per ton).—Cargo Fleet Co.
Four pairs track points (£343 10s.).—Hadfields, Ltd.

Ipswich.—
Installation of h.p. underground and l.p. distribution cables in connection with the linking-up of Saxmundham, Wickham Market, Melton, Orford and Hollesley with the Ipswich mains, also house-service cables and sub-station switchgear.—W. T. Henley's Telegraph Works Co., Ltd.

Irish Free State.—DUBLIN.—City Electricity Department. Accepted :—
Capping and casing for 12 months.—General Electric Co., Ltd.
V.i.r. cable for 12 months.—Deutsche Kabelwerke A.G.
Changeover time switches.—Roper Bros.
—*Irish Builder and Engineer.*

London.—CENTRAL ELECTRICITY BOARD.—Accepted :—
Transformers in connection with the Central Scotland Electricity Scheme.—Ferranti, Ltd. (£130,000); Metropolitan-Vickers Electrical Co., Ltd. (£120,000); English Electric Co., Ltd. (£60,000). Further reference to this contract is made in our "Business Notices."

AIR MINISTRY.—
H.t. accumulators.—Edison Swan Electric Co., Ltd.

ADMIRALTY.—
Springs and contact pieces.—Edison Swan Electric Co., Ltd.

ISLINGTON.—Borough Council. Accepted :—
Electrical sundries for 12 months.—Metro-Vick Supplies, Ltd.

METROPOLITAN ASYLUMS BOARD.—Works Committee. Installation of automatic telephone and call bell systems at the Northern Hospital :—

T. Clarke & Co., Ltd. (Recommended.)	**£1,600**
L. G. Tate & Co., Ltd.	1,610
Reliance Telephone Co., Ltd.	1,635
Alternative	1,449
Alternative	1,760
Alpha Manufacturing & Electrical Co., Ltd. ...	1,740

Salford.—Health Committee. Accepted :—
Electrical rewiring work at 139 and 145, Regent Road.—J. W. France.
Education Committee. Accepted :—
Installation of electric lighting at Wellington Street Infants' School.—County Electrical Co., Ltd.
Electricity Committee. Accepted :—
16,000 yd. l.p. cable and 3,000 yd. e.h.p. cable (£8,080).—N.V. Kabelfabriek, Delft.
3,400 yd. stoneware conduits and pipes (£1,020).—H. J. Baldwin & Co.

Stoke-on-Trent.—Corporation. Accepted:—
Installation of electric lighting at the infectious diseases hospital new nurses' home.—Palmer & Maden.

Forthcoming Events.

Physical Society.—Friday, March 9th. Imperial College of Science, South Kensington, S.W. 5 p.m. Guthrie Lecture, "Electrodeless Discharges through Gases." Prof. Sir J. J. Thomson, F.R.S.

Institution of Engineering Inspection.—Friday, March 9th. Royal Society of Arts, John Street, Adelphi, W.C. 7.30 p.m. "Limit System in Relation to Production and Inspection and some Problems." Mr. L. Nicholson.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, March 10th. Cox's Café, Cardiff. 6.30 p.m. Annual dinner.

(Western District Sub-Branch).—Saturday, March 17th. Wind Street, Swansea. Informal discussion of H.M. Inspectors' Electrical Report, 1926.

Royal Institution of Great Britain.—Saturdays, March 10th and 17th. 3 p.m. "The Transformation of Matter." Sir E. Rutherford.
Thursday, March 15th. 5.15 p.m. "Optics and Chemistry." Dr. J. J. Fox.
Friday, March 16th. 9 p.m. "The Quantum and Relativity Theories of Light." Prof. E. T. Whittaker.
Monday, March 12th, and Wednesday, March 14th. 5.15 p.m. "Wave Mechanics." Dr. E. Schrödinger.

Institution of Engineers and Shipbuilders in Scotland.—Monday, March 12th. 39, Elmbank Crescent, Glasgow. 8 p.m. "Some Technical Problems of Broadcasting." Capt. P. P. Eckersley.

Illuminating Engineering Society.—Tuesday, March 13th. Lecture Theatre of Holophane, Ltd., Elverton Street, Westminster, S.W. 6.30 p.m. "The Manufacture and Properties of Glass and their Application in Illuminating Engineering." Dr. S. English.

Institution of Railway Signal Engineers.—Wednesday, March 14th. Institution of Electrical Engineers, Victoria Embankment, W.C. 6 p.m. "Speed and Route Signal Aspects Compared." Mr. C. W. Prescott.

Royal Society of Arts.—Wednesday, March 14th. John Street, Adelphi, W.C. 8 p.m. "The Lead Acid Cell: Its Place in Modern Industry." Mr. H. G. Brown.

Overhead Lines Association.—Wednesday, March 14th. Institution of Electrical Engineers, Savoy Place, W.C. 5.30 p.m. "Standard Overhead Lines: Their Advantages and the Number of Different Standards Required." Mr. D. C. Redfern.

Institution of Engineers-in-Charge.—Wednesday, March 14th. St. Bride Institute, Bride Lane, E.C. 7.30 p.m. "Wells and Well Boring." Mr. G. A. Hughes.

Institution of Electrical Engineers.—Thursday, March 15th. Institution, London, W.C. 6 p.m. "Some Considerations of the Economics of Electric Power Production." Mr. W. T. Townend.

(North-Eastern Centre).—Monday, March 12th. Armstrong College, Newcastle-on-Tyne. 7 p.m. "Insulating Oils for High-voltage Cables." Messrs. T. N. Riley and T. R. Scott.

(South-Midland Centre).—Friday, March 9th. Chamber of Commerce, Birmingham. 6.30 p.m. Joint meeting with the Institutions of Civil and Mechanical Engineers. "Engineering Works in India." Mr. F. Palmer.

(North-Western Students' Section).—Tuesday, March 13th. Milton Hall, Manchester. 7 p.m. "Electrical Contracting." Mr. T. K. A. Douglas.

(Scottish Centre).—Tuesday, March 13th. North British Station Hotel, Edinburgh. 7 p.m. "Practice and Progress in Combustion of Coal as Applied to Steam Generation." Mr. F. H. Rosencrantz.

(Western Centre).—Monday, March 12th. Corporation Electricity Showroom, Swansea. 6 p.m. "Domestic Applications of Electricity." Messrs. A. J. Milne and A. H. Rawll.

(North-Eastern Students' Section).—Friday, March 16th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Motor Convertors, their Design and Operation." Mr. T. A. Porteous.

British Electrical Development Association.—Friday, March 16th. Savoy Hotel. 2.30 p.m. Annual general meeting. 7 for 7.30 p.m. Annual dinner.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

An electric kettle marked with three hammers and the letters W.A.S.B.

Notes.

E.A.W. Activities.

The third annual conference of the Electrical Association for Women will be held in London on April 17th and 18th next. The programme includes a ball, in connection with which T.R.H. the Duke and Duchess of York have graciously given their patronage.

At the invitation of the British Thomson-Houston Co., Ltd., a visit has been arranged for members of the Association to the "House of the Future" at the Ideal Home Exhibition on March 14th. The party will also visit the stand of the Hotpoint Electric Appliance Co., Ltd., on the same day.

A visit to the Hurley Machine Co. was to take place on March 6th, when a lecture was to be given on "The Home Electric Laundry."

So successful have been the lectures on electric cooking, by Miss Dorothy Vaughan, that a further lecture-demonstration is to be given on March 29th at 3 p.m.

The British Housewives' Association is visiting the electric kitchen of the Association at 46, Kensington Court, on March 30th, when Miss Dorothy Vaughan will again lecture on electric cooking.

On February 29th the members of the Glasgow and District Branch of the Association attended a lecture and demonstration on "Telephone Service from Within," by Mr. A. E. Coombs, Glasgow and district manager of the Post Office Telephones. Mr. Coombs pointed out the necessity of clear pronunciation, and explained that the telephone service very frequently incurred expense owing to bad pronunciation on the part of subscribers.

Faraday House Old Students' Association.

The Association's function this term took the form of a dance held at the Victoria Rooms, Southampton Row, on March 2nd, and was well attended by old students. Dancing was continued until midnight, with short intervals for an exhibition of modern ball-room dancing by Miss Given Moffatt and partner, and a vocal entertainment by the well-known singers, Miss Grace Ivell and Miss Lillian Worth. Balloons and other novelties enlivened the proceedings, which were unanimously voted a success.

The Cracking of Lead Cable Sheathing.

A valuable paper on the cause and prevention of the deterioration of lead cable sheathing by cracking was read at the meeting of the Institute of Metals this week by Messrs. S. Beckingsale, B.Sc., and H. Waterhouse, M.Met. The following are their conclusions:—The work described in this paper has led to the conclusion that the intercrystalline cracking of lead, as occurring, for example, in lead cable sheathing, is essentially a fatigue failure. This conclusion, the evidence for which is given in detail in the body of the paper, is based mainly on the observations that:

1. Failure of cable sheathing in the manner under consideration occurs only in situations in which the cable is subjected to vibration.
2. The form and other characteristics and properties of lead-sheathed cable are such that "vibration" is liable to induce alternating stresses in the lead which are high in relation to its tensile strength.
3. Lead test-pieces subjected to alternating stress fail by the development of intercrystalline cracks identical in their characteristics with those occurring in cable sheathing. It has not been possible to produce similar cracks intentionally in any other way.
4. The fatigue limit of pure lead is very low.
5. Nearly all the failures of the type described occur in pure lead sheaths. Lead alloy sheaths, which have a much higher fatigue limit, very rarely fail in this way.
6. Investigation of the various other explanations which have been suggested to account for failures of this type has given no support to any of them.

Lead resembles other metals in failing by fatigue under alternating stresses which are smaller than the tensile strength of the metal. The cracks formed follow the crystal boundaries, and do not commonly traverse the crystals as in the harder metals.

Archbutt's conclusion that the intercrystalline cracking of lead is not caused by injurious impurities has been confirmed; not only can the purest lead fail in this manner, but it appears very probable that the purest lead has the lowest fatigue limit and is therefore most prone to cracking.

The results obtained do not support the opinion that the cracking of lead is due to unsuitable rolling or extrusion temperatures, and definitely disprove the idea that grain-size is an important factor in causing the failures in lead. For other reasons, however, a small grain-size in lead is preferred. Cracking commences on the interior of the sheathing, and therefore it is concluded that the corrosion factor is in most cases negligible. While it would appear that static stresses of sufficient magnitude to cause "creep" may accelerate the effects of vibration, it is thought that some form of alternating stress is necessary in order to cause intercrystalline failure of the type found in cable sheathing.

While it is desirable to reduce the probability of failures occurring by adopting methods of manufacture, transportation, and installation of cables and lead sheet, which will eliminate vibration effects, a safer and simpler method is to raise the fatigue limit of lead by alloying it with some other metal. Even very small amounts of metals, such as bismuth and silver, which are regarded as undesirable impurities in certain respects, have a beneficial effect in raising the fatigue limit. The most satisfactory method of raising the fatigue limit, however, is to use the binary or ternary alloys of lead containing tin, antimony, or cadmium. The ternary alloys have a permanence of composition during melting and resistance to oxidisation at raised temperatures superior to the binary alloys, while they possess good corrosion resisting properties.

An Electric Vehicle Parade.

The British Electrical Development Association informs us that the Electric Vehicle Committee has decided to organise an Electric Vehicle Section in connection with the Commercial Motor Users' Association's annual parade, which will take place in Lincoln's Inn Fields, London, on Saturday, March 31st. The Committee is awarding four cash prizes to drivers, ranging from 30s. to 10s., and, in addition, a special prize to the engineer in charge of the vehicle awarded first prize. The Committee has appointed the following gentlemen as judges of the Electric Vehicle Section :—Col. R. E. Crompton, Mr. A. C. Cramb, and Mr. A. E. McKenzie. The time-table of the C.M.U.A. meeting is as follows :—Judging commences at 2.30 p.m.; awards at 5 p.m.

Late Legal.

JUDGMENT AGAINST AN EATON COMPANY.—In the Chancery Division on March 6th, Mr. J. Hamlyn, a debenture holder in the Chagford and Devon Electric Light Co., Ltd., moved for judgment against that company in default of defence. His counsel said that the company was one of the concerns promoted by Col. E. O. Eaton, who had recently been sentenced for issuing prospectuses containing false statements. Although the company was authorised to issue £8,000 of debentures, it looked as though far more had been issued.

Mr. Justice Russell entered judgment for the plaintiff on the usual terms of a debenture-holder's action.

PREMIER ELECTRIC WELDING CO., LTD.—Mr. Justice Russell, in the Chancery Division on March 6th, sanctioned a reduction of the capital of this company from £100,000 to £26,250, by cancelling the 12,500 unissued £1 shares, and reducing the value of the remaining shares to 6s. each.

Mr. F. D. Morton, for the company, said it was formed in 1919 to carry on the business of electrically welding metals, and the loss of £61,250 was due mainly to the shipping slump. The company helped to form four others and had lost in them £25,000, and had paid £13,094 of their debts. The company also formed two subsidiaries in one of which they had £5,000 in shares which had since been sold for £50, and in the other £32,940 in shares, which were now valued at £25,000. Patent rights valued at £2,000 had proved to be valueless.

Appointments Vacant.

Distribution assistant (£345) for the Newport (Mon.) Corporation Electricity Department. Deputy electrical engineer and manager (£800) for the City of Leicester Corporation Electricity Department. Telegraph foreman (£400) for the Government of Nigeria. Chief clerk (£320) for the Birkenhead Corporation Electricity Department. Charge engineer (£303) for the Tunbridge Wells Corporation Electricity Department. Engineer-Draughtsman (junior) for the Worcester Corporation Electricity Department. (See our advertisement pages to-day.)

Fatalities.

James Nairn, of Dreghorn (Ayrshire), received a fatal electric shock on February 29th. With the assistance of other men he was erecting a steel pole for his wireless aerial when it toppled over and came into contact with an overhead line conveying electricity to the distributing station at Dreghorn. Three men and a woman, who received injuries, were taken to Kilmarnock Infirmary, where one of the men died later from burns on the hands and legs.

Trade Discount Dispute.

In the King's Bench Division recently, Mr. Justice Humphreys had before him an action in which Messrs. S. G. Brown, Ltd., sued Messrs. Ward & Goldstone, Ltd., for £315 11s. 7d., representing certain discounts which the defendants claimed to be entitled to in trading with the plaintiffs. Mr. Raynor Goddard, K.C., for the plaintiffs, said his clients contended that there was no ground in the agreement between the parties for allowing the discounts, which had been passed through a clerical error. The defendants also took the point that they had receipts for the sums they had paid in settlement of the accounts, and pleaded that the plaintiffs were estopped from bringing their claim. The evidence showed that Messrs. Brown decided in March, 1926, to allow 30 per cent. discount only, and the defendants were notified of the alteration. They continued, however, to deduct the discount to which they had previously been entitled, a fact which the plaintiffs did not immediately discover. His Lordship gave judgment for plaintiffs for the amount claimed, with costs.

Electrons at Large.

Striking reports of demonstrations which took place at the research laboratories of the General Electric Co., Schenectady, on Saturday last, have appeared in the lay Press. Dr. W. D. Coolidge, with his improved cathode-ray tubes, using a pressure of nearly a million volts, projected electrons from the interior of the tubes into the open air, in such quantities that extraordinary phenomena are said to have been produced. Incandescent lamps and neon tubes, unconnected with any electrical apparatus, glowed brightly; metal bars, without becoming hot, blistered the fingers; food was cooked in a glass tube, and small animals and insects exposed to the radiation were killed. Various chemical and physical changes were effected, and remarkable brush discharges were produced.

Electricity in Gas Works.

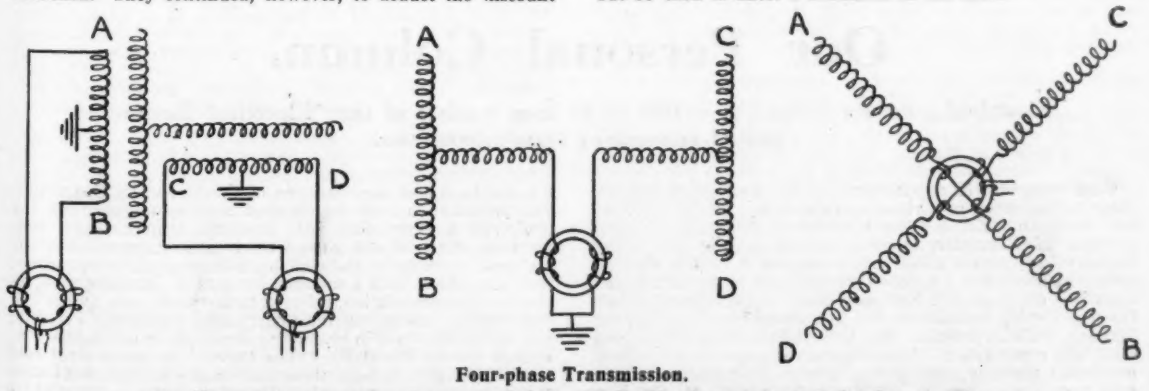
In a paper read by Mr. F. M. Birks before the London and Southern District Junior Gas Association on January 27th, on the "Mechanical Plant at the Beckton Works of the Gas Light and Coke Co.," reproduced in the *Gas World*, some interesting particulars are given as to the use of electricity in the works. The economy, cleanliness, and ease of control of electric power transmission have resulted in its continued extension until now 360 motors are in use. The original plant generated d.c. at 220 V, which has proved itself very flexible and safe for working stoking machines and other retort house machinery. With the rapid extensions that have been found necessary of recent years, together with the need to transmit large powers over considerable distances, a higher voltage became inevitable, and for all new work, with the exception of stoking machines, 440-volt, 3-phase, 50-cycle a.c. motors are used. The main distribution around the works is at 6,600 volts, and two transformer houses are placed near points where large quantities of current are required. The supply pressure is 440 V. Of the 300 pumps which are in operation throughout the works, many, with the exception of those used for boiler feeds, are being converted for electric driving.

The Ex-British Westinghouse Association.

On March 2nd, at the Hotel Cecil, London, Mr. A. McKinstry presided at the tenth annual reunion of this Association, the attendance nearly reached the "record" number present at the first dinner, and ex-B.W. men from all parts of the country turned up to meet colleagues of the old Trafford Park days. A most enjoyable evening was spent, the proceedings being entirely informal. Community singing was lustily indulged in, "the congregation" displaying both tone and power in a wonderful variety of voices; Mr. J. G. Wilson humorously proposed the toast of the Association, and of the Chairman, who, in the course of his reply, referred to the unique character of the Association, the strength of its membership, and the enthusiasm shown at all its reunions. The Association perpetuated the name of a great engineer—George Westinghouse—in whose service years ago great loyalty and courage had been shown. "Absent Friends" and the "Silent Toast" were given on the stroke of 10 o'clock. The musical entertainment included some novel mechanical and electrical inventions, displayed by Mr. Gordon Freeman, the most amusing being a candle alarm clock and a beetle trap. The opportunity was taken to present a silver tea service and cigarette box to Mr. L. S. Richardson in recognition of his services as hon. secretary of the Association for 10 years. The next reunion will be at the Hotel Cecil on March 8th, 1929. The winner of the ballot for life membership will be announced later.

The Burden of Rates.

The Federation of British Industries has addressed a letter to local authorities throughout the country drawing attention to the baneful effects upon industries of heavy local rates. The authorities are requested to do their best to reduce the burden, and a particular point is made of the probable increases in assessments under the new Rating and Valuation Act, which, it is said, should not lead to a greater expenditure, but be used to effect a reduction in the rates.



Four-phase Transmission.

The diagrams here reproduced accompanied Mr. W. B. Woodhouse's letter, printed on p. 415.

Electrical Accidents in Mines.

The preliminary statement of the number of deaths caused by accidents in and about the mines and quarries of Great Britain, together with the Isle of Man, during the year 1927 (H.M. Stationery Office, price 3d. net) shows that there were 1,105 separate fatal accidents, causing 1,206 deaths, against 1,145 accidents, 1,233 deaths, and 708 accidents and 729 deaths for the years 1925 and 1926 respectively. In the mines under the Coal Mines Act, 1911, there were nine deaths from electrical accidents, eight above, and one below ground, out of a total of 1,126. There were no electrical fatalities in the metalliferous mines or quarries.

London I.E.E. Students' Section.

On Tuesday the 21st annual dinner of the London Students' Section of the Institution of Electrical Engineers was held at the Imperial Hotel. The chairman of the Section, Mr. R. A. Brockbank, occupied the chair, and the guest of the evening was Mr. Archibald Page, President I.E.E.

After the loyal toast, the hon. secretary, Mr. S. H. Hart, proposed "The Institution of Electrical Engineers," urging the members of the Section not only to enjoy the privileges of membership, but also to consider what services they could render to the Institution. He expressed regret at the absence, for the first time, of Mr. P. F. Rowell, secretary I.E.E., through illness. Responding, Mr. Page commended the devotion of the many honorary officials who did so much for the Institution, and said the satisfactory position of the Institution was due to the happy spirit of co-operation which obtained. The local Centres exercised a vitalising influence, and he rejoiced in the freshness of outlook and vigorous growth of the Institution. The applications of electricity were expanding at a bewildering rate, and its possibilities were unbounded; the future of the electrical engineer offered a rosy prospect.

Dr. R. C. Fox proposed "Our Guests," referring especially to Mr. Page and Mr. R. W. Paul, representative of the Council in the Students' Section, and to Mr. Tree, who rendered the Section invaluable services. Mr. H. W. Cadman responded in humorous vein.

Mr. R. W. Paul proposed "The Students' Section," drawing a picture of the household of the future, in which the womenfolk would have nothing to do. He considered the Section a very active one, the meetings being well attended; it had been said that the best teacher of students was a student, and the interchange of ideas at meetings was very helpful.

Mr. Brockbank, in his reply, said the Section had had better papers and visits this year, but the social functions had not been well supported, and an attendance of some 50 members that evening, out of a total of 1,500, was not satisfactory.

During the evening entertainment was provided by Messrs. F. Corthesy, Frank Staff, and E. S. Noakes (guests), and Messrs. Charles Wreford and Ronald Gourlay.

The British Association.

The 1929 meeting of the British Association for the Advancement of Science is to be held in South Africa, and the Council has nominated Sir Thomas Holland, of the Imperial College of Science and Technology, as president.

Awards to Inventors.

The fifth report of the Royal Commission on Awards to Inventors, covering the years 1926 and 1927, was issued recently. Included in the awards are: £25,000, with liberty to apply as to a further award, to Messrs. Peter Brotherhood, Ltd., for improvements in internal-combustion engines; £12,880 to the Electric Boat Co., Mr. G. Caldwell Davison, Mr. I. M. Spear, and Messrs. Vickers, Ltd., for improvements in submarines; and £4,000, plus royalties, to Messrs. Metropolitan-Vickers Electrical Co., Ltd., respecting wireless reception apparatus.

Institution Notes.

Institution of Electrical Engineers.

Informal Meeting.—The meeting held on Monday, February 27th, was for two reasons of especial interest: First, it was the 101st of the series, and Mr. F. Pooley, who opened the discussion at the inaugural meeting on March 17th, 1919, was on this occasion officiating as chairman. Secondly, the subject of the discussion, "132,000-volt Cables," opened by Mr. L. Emanueli, secured a record attendance for these meetings. In introducing the speaker, the chairman said the Informal Meetings Committee was fortunate in securing Mr. Emanueli's paper, as it was only on the ground that it had already received publicity in America that it was not accepted for reading before an ordinary meeting.

The cables which Mr. Emanueli described were two feeders installed in the United States last year, which were developed from a similar experimental installation near Milan. They were (1) the Chicago line, completed in June last, six miles long and under water for its full length, being practically level; and (2) the New York line, completed in August, twelve miles long, with many gradients, eventually rising 300 feet. Mr. Emanueli showed lantern slides and a kinematograph film illustrating the actual installing of the lines, which are in the form of three pipes containing oil, drawn into ducts below ground, with reservoir manholes or with expansion tanks in feeder towers for the oil. The design of the cable is that of a spiral of hard-drawn copper forming a hollow core of three-quarters of an inch internal diameter, over which are two layers of copper conductors, upon which is laid a wood-pulp paper insulation, also about $\frac{3}{4}$ in. thick. The whole is then armoured and lead-sheathed.

The determining factors of the length of each section are: first, the maximum permissible hydrostatic strain by oil at the lowest point; and, secondly, the fact that oil expands in consequence of the heating of the cable and has to run to the expansion tank. As the cable cools oil has to flow from the feeding tank into the cable, and in this process a vacuum may be built up and the dielectric become unimpregnated.

The cable works at 65 deg. C., a higher temperature than is customary in this country, but Mr. Emanueli said that a cable now under preparation was rated to work at a still higher temperature, and he did not think 85 deg. C. beyond future practice.

It is declared that the troubles met with so far have been entirely due to the leakage of oil through defective lead wipes, but that these have now been eliminated. There is no alternative supply in case of a breakdown, and it shows remarkable confidence that a supply authority gives the cable this responsibility.

The question of cost was raised. Mr. Emanueli stated that the New York line cost $4,000,000, but this sum covered transformers, spare ducts, testing apparatus, and other equipment. The point was made, however, that the cable supplied a congested area, and an alternative to it might very well have been a new super-power station.

Summer Meeting.—In view of the comparatively small number of members who expressed a desire to take part in the proposed Summer Meeting in Norway next June, it has been decided not to proceed with the arrangements.

Diesel Engine Users' Association.

At the meeting which is to be held on March 30th a paper entitled "Liquid Fuel from Coal" is to be read by Mr. David Brownlie, B.Sc., F.C.S. Visitors who are interested can obtain tickets of admission from the joint honorary secretaries at 19, Cadogan Gardens, London, S.W.3.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review posted concerning their movements.

There were over 50 applications for the position of borough electrical engineer of Grimsby, vacated by Lt.-Col. W. A. Vignoles, and Mr. Sydney R. Windle, borough electrical engineer of Doncaster, is recommended for the post. The Grimsby Corporation Electricity Department held a farewell dinner in honour of Lt.-Col. Vignoles, and made him a presentation, on Saturday, February 25th, in the Masonic Hall. He was leaving to take up his new duties on the following Tuesday, February 28th. Mr. A. S. Channon presided, and made the presentation. Mrs. Vignoles accompanied her husband, but the only other guests outside the members of the staff were Councillors W. H. Thickett and W. E. Fletcher, the chairman and vice-chairman of the Electricity Committee. The presentation took the form of a silver teapot, from the staff, and a Perry slide rule from the local electrical contractors. Each of the diners received a humorous booklet, and each member of the staff an autographed photograph of their late chief, with a message from him. Mr. Channon, in making the presentation, referred to the work done by Lt.-Col. Vignoles in building up the undertaking during his 27 years, and to his influence in promoting the happy relationships that existed among the staff. "The Chief," in responding, said that it was only because there had been real team work that things had gone so smoothly. He referred also to the support

of the chairman and vice-chairman of the Committee, and of the electrical contractors, who were an important part of an undertaking. Mr. G. W. Parker proposed the "Chairman and Vice-Chairman," and Councillor Thickett, responding, remarked that the E.D.A. was getitng a man who would serve it to its utmost satisfaction. Mr. M. Jennison made the presentation for the contractors, in place of Mr. Percy Watson, the oldest contractor in the town, who was unable to be present through illness. In a further reply, Lt.-Col. Vignoles mentioned the electrical exhibition which was to be opened on March 5th. He hoped that the co-operation of the contractors with the department would continue.

Mr. J. A. BROMLEY, manager of the York Corporation Tramways since 1922, has been appointed from 46 applicants as general manager of the Durban municipal transport undertakings, at a salary of £1,250. He will leave England at the end of May. Mr. Bromley served his apprenticeship with Messrs. Greenwood & Batley, of Leeds, his native city, and was subsequently on the Leeds tramways engineering staff for 14 years. He relinquished the post of chief assistant rolling stock inspector to go to Keighley as general manager of the Corporation tramways. The Leeds Corporation lent him to the Government for special engineering work during the war.

Mr. HAROLD HOBSON, M.I.E.E., A.M.Inst.C.E., has resigned his appointment on the staff of the County of London Electric Supply Co., Ltd., and has taken up, as from March 1st, the position of supply engineer under the Central Electricity Board.

Lord ASHFIELD announced at the recent meeting of the "Underground" group that Mr. FRANK PICK had been given the title of managing director. Mr. Pick has been in the service of the Underground Railways for 21 years.

Mr. GEORGE GALL, deputy controller, Edinburgh Postal and Telegraph District, retired on March 3rd, on reaching the age limit, after 43 years' service. He was presented with a bureau by his colleagues.

Mr. JOHN LOW, overseer in the telegraph department, G.P.O., Edinburgh, retired under the age limit on March 1st. During the war Mr. Low served for some months as telegraphist with the Grand Fleet at Scapa Flow, and later in the wireless service at different stations in England.

Mr. R. H. GREEN has recently been appointed assistant sales manager of the Ipswich works of Petters, Ltd.

Upon leaving to take up an appointment with the Brompton and Kensington Electric Supply Co., Mr. L. ROSEVEARE, a member of the Torquay Corporation electricity works staff at Newton Abbot, has been presented with a suitcase and a fountain pen. The presentation was made by Mr. H. F. G. Woods, borough electrical engineer.

Mr. L. B. BEALE, Trade Commissioner in New Zealand, will attend at the offices of the Department of Overseas Trade from March 12th until the end of the month for the purpose of interviewing firms interested in the export of British goods to New Zealand. Firms desiring interviews with Mr. Beale should apply to the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference D.O.T. 343/1/28.)

Lord ASKWITH, K.C.B., K.C., announced at the luncheon at the British Industries Fair, Birmingham, on March 1st, that he had been nominated as a director of the County of London Electric Supply Co., Ltd., and had accepted that position.

Mr. BERNARD DUDLEY F. DOCKER has been elected a director and deputy chairman of the Metropolitan-Vickers Electrical Co., Ltd.

Mr. E. J. JARVIS, electrical engineer and manager to the Ilkley Urban Council, is recommended for the appointment of electrical engineer to the Scarborough Corporation. There were 93 applicants.

The Leicester Corporation Electricity Committee recommends that the chairman (Mr. A. H. Swain), the vice-chairman (Mr. J. Minto), and Mr. W. B. Wykes be re-appointed members of the East Midlands Electricity Advisory Board for the year, and that Mr. John Mould, the acting engineer, be nominated for appointment on the Engineering Advisory Committee of that Board (in place of Mr. T. R. Smith).

The Croydon Corporation Finance Committee recommends that the salary of Mr. A. C. CRAMB, borough electrical engineer, be increased from £1,400 to £1,500 per annum.

Mr. G. G. DEELEY, charge engineer at Tunbridge Wells electricity works, has been appointed charge engineer to the South Lancashire Tramways Co.

Mr. C. M. R. BALBI, who is hon. consulting electrical adviser to the National Institute for the Deaf, and has several times written for the ELECTRICAL REVIEW on the subject of electrical aids for the deaf, has recently been appointed co-technical adviser to Messrs. Oravox, Ltd., with Sir Oliver Lodge, F.R.S., and Professor Pollard, F.Inst.P., A.M.I.E.E. This company has been formed for the purpose of producing a really efficient electrical aid.

Obituary.—MR. H. W. WOODS.—The death took place on February 24th, at the age of 63 years, of Mr. H. W. Woods, director of Henry Bacchus, Ltd., electrical engineers, of High Street, Bedford. He had been with the firm for 23 years, and for some time had had charge of the electrical heating and lighting department.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Westward Electrical Co. (1928), Ltd.—Private company. Registered March 2nd. Capital, £3,000 in £1 shares. Objects:—To acquire the business of electrical engineers and wireless and electrical requisite dealers and manufacturers now carried on by A. D. Herbert and H. L. Bangham at 36, St. Helen's Road, Swansea, as "Westward Electrical Co. (1927)." The provisional directors are:—A. D. Herbert, "Brymailais," Ammanford, engineer; H. L. Bangham, Caswell Road, Mumbles, Swansea, accountant. Solicitor: R. D. Edwards, Central Chambers, Goat Street, Swansea.

Stenbows, Ltd.—Private company. Registered March 2nd. Capital, £150 in £1 shares. Objects:—To carry on the business of an electro-medical therapeutic establishment, electrical and vibratory masseurs, manipulative practitioners, &c. The subscribers (each with one share) are:—G. H. Olley, 161a, Strand, W.C., solicitor; C. Morgan, 161a, Strand, W.C.2, solicitor's managing clerk. The first directors are to be appointed by the subscribers. Solicitors: Geo. H. Olley and Co., 161a, Strand, W.C.2.

Adey Wireless, Ltd.—Private company. Registered February 25th. Capital, £1,500 in £1 shares. Objects: To carry on business as manufacturers and repairers of and dealers in portable wireless sets, loud speakers, long-range receivers, cabinet receiving sets, wavemeters and wireless parts, electrical and mechanical engineers, &c. The subscribers (each with one share) are:—G. F. Puckle, 3-4, Lincoln's Inn Fields, W.C.2, clerk; Edith F. Keeler, 3-4, Lincoln's Inn Fields, W.C.2. Secretary: G. F. Puckle. Registered office: 99, Mortimer Street, W.1.

A. W. Griffin & Co., Ltd.—Private company. Registered February 27th. Capital, £1,000 in £1 shares. Objects: To carry on the business of wireless and general electrical and mechanical engineers and contractors, &c. The first directors are:—A. W. Griffin, West Avenue, Redditch, wireless instrument manufacturer; V. W. Turner, Sambourne, near Redditch, wireless instrument manufacturer. Secretary: A. W. Griffin. Solicitor: G. B. Pickering, 16, Unicorn Hill, Redditch.

A.E.S. (Construction), Ltd.—Private company. Registered March 1st. Nominal capital, £5,300 in 5,000 "A" shares of £1 each and 6,000 "B" shares of 1s. each. The "A" shares confer the right (1) to 40 per cent. of the profits each year available for dividend, and (2) in a winding up to 40 per cent. of the assets available for distribution. Objects: To construct, work, develop, or control in Great Britain, Northern Ireland, and elsewhere, public works and conveniences of all kinds, including electric light and power, railways, tramways, docks, wharves and other works or conveniences of public utility; to carry on the business of electricians, mechanical engineers, manufacturers of and dealers in electricity, motive power and light, suppliers of light, heat, and power, carriers of passengers and goods, &c. The subscribers (each with one "A" share) are: A. Goodwin, 33, Norfolk Road, Brighton, solicitor's manager; A. E. Stream, 23, Favart Road, Fulham, S.W.6, clerk. Solicitors: Swann, Hardman and Co., 10, Norfolk Street, Strand, W.C.2.

Community Radio (1928), Ltd.—Public company. Registered February 25th. Capital, £30,000 in £1 shares. Objects: To adopt an agreement with the Community Radio Syndicate and to develop and turn to account the business of receivers, distributors, and relayers of radio, television, and other programmes, and radio engineers and manufacturers, &c., comprised therein; to erect radio or television stations in Blackpool, Lytham St. Annes, Fleetwood, and adjoining districts. Minimum cash subscription, 8,000 shares. The first directors are: H. A. Thickett, "Arden," Richmond Place, Blackpool, auctioneer and valuer (chairman); W. R. Duckworth, 375, Promenade, South Shore, Blackpool (vice-chairman); A. T. Liver, "Bylands," Clifton Drive, Lytham St. Annes, cotton manufacturer; H. J. Liver, "Brookfield," Clifton Drive, Lytham St. Annes, cotton manufacturer; J. A. A. Taylor, "The Warren," Hastings Road, Thornton Cleveleys, solicitor. Secretary: W. Latham, C.A. Registered office, Union Bank Chambers, Clifton Street, Lytham St. Annes.

Caledonian Electric-Chemical Co., Ltd.—Registered in Edinburgh, February 25th. Capital, £47,000 in 25,000 7½ per cent. cumulative participating preference and 20,000 ordinary shares of £1 each, and 50,000 deferred shares of 1s. each. Objects: To carry on the businesses of manufacturers of antimony sulphide by the electro-chemical process, chemical, electrical, mechanical, heating, lighting, hydraulic, consulting and contracting engineers, manufacturing and consulting chemists, &c. The first directors are: A. B. Muirhead, 48, West Regent Street, Glasgow, consulting engineer; D. Martin, 45, Hope Street, Glasgow, electrical engineer; C. O. Griffith, Shanwell Road, Tayport, Fifeshire, manufacturing chemist; J. R. Rutherford, The Grange, Lenzie, chartered secretary; R. M. Russell, Baillieston House, Baillieston, Glasgow, electrical engineer. Secretary: T. R. Anderson. Registered office, 167, St. Vincent Street, Glasgow, C.2.

John Irving & Sons, Ltd.—Private company. Registered in Edinburgh, February 27th. Capital, £10,000 in £1 shares. Objects: To acquire the business of a plumber, sanitary, and electrical engineer and gasfitter, carried on by J. Irving, at 328, Pollokshaws Road, Glasgow, 1156, Shettleston Road, Glasgow, and at Lade Street, Largs, Ayrshire. The first directors are: G. J. Irving, 27, Melville Street, Pollokshields, Glasgow, plumber, &c.; A. Irving, 158, Kingswood Drive, Kings Park, Glasgow; J. Irving, 914, Pollokshaws Road, Glasgow; J. Irving, junr., Gogo House, Largs; W. Irving, 27, Melville Street, Pollokshields, Glasgow, electrical engineer. Secretary: A. Irving. Registered office, 328, Pollokshaws Road, Glasgow.

P.D.P. Company, Ltd.—Private company. Registered February 29th. Capital, £5,050 in 5,000 8 per cent. cumulative preference shares of £1 each and 1,000 ordinary shares of 1s. each. Objects: To acquire the business of a wireless and gramophone manufacturer's agent and dealer, &c., carried on by A. C. Dixon, at 41, Great Tower Street, E.C. The first directors are: E. S. Marks, 18, Thorney Court, Palace Gate, W.8, engineer; A. C. Dixon, 15, Thurlby Road, West Norwood, S.E.27, merchant; A. C. Dixon is permanent managing director subject to holding 500 ordinary shares. Registered office: 41, Great Tower Street, E.C.3.

Radio Maintenance, Ltd.—Private company. Registered February 29th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers, erectors, and repairers of wireless, telegraphic, and telephonic apparatus, valves, equipment and accessories, &c. The subscribers (each with one share) are: T. L. Fox, 33, Manor Drive, Wembley Park, accountant; A. D. Pettit, 7, South Hill Park, Hampstead, N.W.2, clerk. Secretary: J. J. Middleton. Registered office: 15-17, King Street, St. James's, S.W.1.

Broadcast Relay Service, Ltd.—Private company. Registered March 1st. Capital, £2,000 in £1 shares. Objects: To construct and maintain wireless signal stations and all other stations for the reception of wireless or radio signals or waves, &c. The permanent directors are: J. F. Powell (managing director), Pembroke Lodge, Wellesley Road, Clacton-on-Sea; H. Solomon, Beach Lea, Collingwood Road, Clacton-on-Sea. Qualification: £250 shares. Solicitors: Leaning & Carr, Clacton.

Official Returns of Electrical Companies.

Courtin & Walsh, Ltd.—Satisfaction in full on February 9th, 1928, of debenture dated October 25th, 1927, securing £1,325.

Hazeltine Neutrodyne Radio Sets, Ltd.—Capital, £5,000 in £1 shares. Return dated December 29th, 1927. 4,900 shares taken up. £1 per share called up on 2,550 shares. £2,250 calls unpaid. Mortgages and charges nil.

Prince's Electrical Clocks, Ltd.—Capital, £3,000 in £1 shares. Return dated November 4th, 1927. All shares taken up. £1,000 paid. £2,000 considered as paid. Mortgages and charges nil.

East India Tramways Co., Ltd.—Capital, £125,000 in 15,000 preferred, 35,000 ordinary, and 75,000 deferred shares of £1 each. Return dated December 13th, 1927. 7,476 preference, 33,433 ordinary, and 75,000 deferred shares taken up. £7,489 paid on 7,476 preference and 7 ordinary shares (including £6 paid on 24 preference shares forfeited). £108,426 considered as paid on 33,426 ordinary and 75,000 ordinary shares. Mortgages and charges nil.

Short Wave Communications Development Co., Ltd.—Particulars filed of £2,000 debentures authorised February 2nd, 1928, charged on the company's undertaking and property, present and future, including uncalled capital and land and two houses in Wickford, the amount of the present issue being £37,500.

Marston Billington, Ltd.—Satisfaction in full on January 5th, 1927, of debenture dated May 27th, 1920, securing £25,000. (Notice filed February 16th, 1928.)

Basson Electrical Co., Ltd.—Capital, £500 in 100 preference and 400 ordinary shares of £1 each. Return dated January 11th, 1928. 202 ordinary shares taken up, £202 paid. Mortgages and charges, nil.

Brijane, Ltd.—F. T. Shearcroft, 288, Upper Richmond Road, S.W.14, ceased to act as receiver or manager on February 3rd, 1928.

Unelma, Ltd.—F. T. Shearcroft, 288, Upper Richmond Road, S.W.14, ceased to act as receiver or manager on February 3rd, 1928.

Whitfield Electrical Co., Ltd.—J. B. Rubens, 23, Surrey Street, Strand, W.C., ceased to act as receiver or manager on February 16th, 1928.

Colleys, Ltd.—Debenture dated February 22nd, 1928, to secure £8,000, charged on 3-12, Marine Street, Bermondsey, and the company's other property, present and future, including uncalled capital. Holders: J. S. Phillips, and F. L. Monk, 25, Ludgate Hill, E.C.

Adelaide Electric Supply Co., Ltd.—Acknowledgment of indebtedness dated February 3rd, 1928 (supplemental to trust deed dated June 11th, 1918, and deeds supplemental thereto) to secure debenture stock for £250,000 charged on company's undertaking in Australia (excluding dividend equalisation fund and uncalled capital). Trustees: Electric & General Investment Company, Ltd., Falcon House, Aldersgate Street, E.C.1.

Grierson Ledway Co., Ltd.—G. Hannah, 115, Abbey Road, Barrow-in-Furness, was appointed receiver on February 17th, 1928, under powers contained in debenture dated June 13th, 1925.

G. & L. Electrical Supply Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 27th, 1928. All shares taken up. £998 considered as paid, £2 calls in arrears. Mortgages and charges, nil.

Strange & Sons Electrical Engineering Co., Ltd.—Capital, £200 in £1 shares. Return dated November 14th, 1927. 32 shares taken up. £32 paid (excluding £9 per share premium). Mortgages and charges, nil.

Permec, Ltd.—Capital, £100 in 1s. shares. Return dated November 3rd, 1927. All shares taken up. £100 paid. Mortgages and charges, nil.

W. G. Cannon & Sons, Ltd.—Capital, £3,000 in £1 shares. Return dated December 29th, 1927. All shares taken up. £9 paid, £2,991 considered as paid. Mortgages and charges, nil.

Western Telegraph Co., Ltd.—Capital, £3,500,000 in £10 shares. Return dated December 8th, 1927. 311,895 shares taken up. £2,339,650 paid, £779,300 considered as paid. Mortgages and charges, £818,675.

Barbados Electric Supply Corporation, Ltd.—Capital, £60,000 in 40,000 preferred and participating and 20,000 ordinary shares of £1 each. Return dated January 3rd, 1923. 35,172 preferred and 20,000 ordinary shares taken up. £34,672 paid on 34,672 preferred shares, £20,500 considered as paid on 500 preferred and 20,000 ordinary shares. Mortgages and charges: £20,000.

City Notes.

Power Securities Corporation, Ltd.

The annual meeting was held last week, Mr. George Balfour (chairman) presiding. In presenting the report (*vide* our last issue, p. 386) Mr. Balfour said that during the past year the company carried out, through the organisation of Balfour, Beatty & Co., Ltd., a large amount of work, including the construction of plants at home and abroad, and it had at the present time under construction or on order steam and hydro-electric plants aggregating 120,000 kW. The tunnel construction works at Lochaber were making rapid progress. The company's interest in the Grampian Company had been sold to the Scottish Power Co., Ltd., which had contracted for the development of the undertaking. A start had been made on the hydro-electric works, and a supply was being developed

in several portions of the territory. Pending the completion of the hydro-electric plant a supply would be given from the Grampian Company's steam power station, which, in the first instance, would act as a development station, and after the hydro-electric works were in operation would be used as a steam auxiliary. The Grampian Company had already entered into a long term contract ensuring a satisfactory load on the hydro-electric plant from the day it commenced operating, and in addition to this contract, load would be developed as above indicated, which would be available for the hydro-electric plant when completed. Business in South America continued to expand, and preliminary arrangements had been made for the development of an extensive hydro-electric scheme in one of our dependencies, and, in addition, several concessions dealing with public utility development were under negotiation. The company's investments were valued at £695,404, and loans and participations amounted to £177,401, as against £139,142 for the previous year. This was made up of approximately the same items as were included in the preceding year, with the addition of a secured advance of £35,000 to one of the associated electricity supply companies. The report and accounts were adopted.

St. James' and Pall Mall Electric Light Co., Ltd.

Mr. G. W. Balfour presided at the annual meeting on February 28th. In presenting the report (*vide* ELECTRICAL REVIEW, February 24th, p. 342) Mr. Balfour said that the electrical energy sold not only constituted a record, but the increase of more than 4,000,000 kWh, or approximately 17 per cent., as compared with the preceding year, was the largest in the history of the company. Further demands from the Regent Street and other areas indicated that there would again be a healthy advance. As reported last year, the whole of the company's output was now supplied by the London Power Co., and in spite of the large increase in the sales of electricity the price paid for a bulk supply was £8,000 less than the previous year, although this was mainly due to the lower price of coal. Reductions in the charges for electricity were made at the commencement of the present year, and it was hoped to announce further reductions in the near future. The work of raising the voltage from 110-220 to 220-440 would be completed by the end of 1928. Application had been made for permission to establish a 3-phase, 4-wire distribution system at 400-230 V. Prospective capital expenditure was £60,000, of which approximately half would be required for the new distribution system. Referring to the London Power Co., Mr. Balfour said it was to erect a new power station at Battersea with an ultimate capacity of 400,000 kW. This, together with extensions at Bow, Deptford, Grove Road, and Willesden, would give a total installed capacity of 900,000 kW, which would be adequate provision for the future requirements of the constituent companies and of the St. Marylebone Borough Council in addition. The report and accounts were adopted.

Yorkshire (West Riding) Electric Tramways Co., Ltd.

The annual meeting of this company, whose report was reviewed in our last issue, was held on March 1st. Sir George E. Leon (chairman), who presided, pointed out the necessity for retaining the company's liquid resources to enable it to face the present difficult position and to make provision for future changes and developments. The motor-omnibus services were being developed to take the place of the tramways, which had been abandoned. In many areas unrestricted omnibus competition had been set up, but nothing had been done by the Government or by local councils to relieve the tramways of the burden of road-upkeep costs, local rates, &c. A committee was set up by the Minister of Transport, and in its report issued in 1926 it forecast certain regulations to restrict competition with established tramway and light railway services, but nothing of an effective nature had been done. The company had to bridge over a transition period from tramways to motor-omnibuses, and, if successful, it should be able to accumulate sufficient money to gradually build up its motor-omnibus company. Sir George said he hoped some scheme of effective control and co-ordination of road passenger services would be brought about. This would not only be to the public advantage, but would assist public utility companies to consolidate and stabilise their businesses. The report and accounts were adopted.

Scottish Power Co., Ltd.

The annual meeting was held on March 2nd, Mr. H. Brown (chairman) presiding. In presenting the report and accounts (ELEC. REV., March 2nd, p. 386), the chairman said that the company now owned the whole of the issued capital of the Scottish Central Electric Power Co., the Grampian Electricity Supply Co., the North of Scotland Electric Light and Power Co., Ltd., the Crieff Electric Supply Co., Ltd., and the Dunblane and District Electricity Supply Co., Ltd., and, with the exception of 257 shares, that of the Arbroath Electric Light and Power Co., Ltd. The company also held a number of provisional orders in the Scottish Central area. The chairman referred at length to recent developments, and said that arrangements were being made to develop the area of the Grampian Co., and a commencement had been made upon the construction of the hydro-electric works at Ericht. The Arbroath station had been transferred to the Grampian Co.; the plant would be increased and the station would serve the requirements of the area until the hydro-electric plant was ready. Arrangements had been made to connect the Arbroath station to Montrose, Brechin, Forfar, Canoustie, and Monifieth. A small generating station had been established at Kingussie to supply that town and Newtonmore. The Bonnybridge station was being extended by the addition of 12,500 kW. The whole of the area of the company's undertakings was included in the Central Scotland scheme, with the exception of a portion of the Grampians area. In conclusion, Mr. Brown said that he had decided to vacate the position of chairman. Recent developments would lay larger responsibility upon the technical director, Mr. George Balfour, and he thought that Mr. Balfour should combine with his present office that of chairman of the board. The report and accounts were adopted, and at a subsequent meeting a resolution was passed increasing the authorised share capital from £1,500,000 to £2,500,000.

North Metropolitan Electric Power Supply Co.

Sir James Devonshire, K.B.E. (chairman), presided at the annual meeting on February 28th, and in presenting the report and accounts (*vide* our last issue, p. 385) said that the year had been one of great progress. After reviewing the year's work and the accounts, Sir James said that the balance of the purchase price of the Willesden station had been paid off so that the company was now absolute owner of the station, freed from any mortgage. The undertaking of the Stevenage Electric Light & Power Co., Ltd., had been transferred to the company and the Stevenage Company was now being wound up. Good progress had been made with the new Brimsdown station, which had been scheduled as a "selected" station under the South-East England scheme. They hoped that the station would be completed and working in the early summer. The output during the year was sold at an average figure of 1.02d. per kWh, which was very low, having regard to the cost of coal in the Metropolitan area. The average price paid by domestic and small power users was 3.04d. per kWh. The company carried out extensive publicity work in its area, and to encourage the use of electricity for all domestic purposes had instituted an "annual service rate" which was so framed that the consumer received the maximum benefit from his expenditure, and the more electricity he used the lower the average price became. The report and accounts were adopted.

Charing Cross Electricity Supply Co., Ltd.

The report for the year ended December 3st last shows that the gross earnings of the West End Undertakings rose from £323,241 to £337,839, and the net earnings from £83,374 to £121,030. Adding £468 brought forward and interest, &c., £64,054, the amount available is £185,553. After meeting debenture charges, paying dividends, &c., a balance of £43,008 is carried forward. The connected load rose to 32,866 kW. The City Undertaking records gross earnings of £354,527 (against £329,911) and a net revenue of £100,414 (£81,696). To the latter amount is added a balance of £411 brought forward and rent and sinking fund in respect of Bow generating station, &c., £135,533, making available £236,358. After meeting charges and paying 10 per cent. on £350,000 of ordinary shares and 7 per cent. on £200,000, a balance of £16,113 is carried forward. The generating station and transmission mains have been taken over by the London Power Co., Ltd., and the power stations at Bow, Grove Road, and Willesden, are now all interconnected. A new station is in course of erection at Deptford, and active steps are being taken to erect a further large station at Battersea. The meeting was to be held yesterday (Thursday).

London and Suburban Traction Co., Ltd.

The annual meeting was held on February 28th. Lord Ashfield (chairman), who presided, said that the gross traffic receipts during 1927 were £1,142,000, a decrease of £447,000 as compared with 1922, the company's best year since the war, and the number of passengers carried was 1,012 millions, a decrease of 31 millions over the same period. The actual contribution made by the tramways to the carriage of London's traffic was still so material that no other form of transport could lightly take it up if, for any reason, the tramways were to cease operation. The crux of the problem was that the public was heedlessly acquiescing in a competition upon the streets, which would, unless checked, ultimately prejudice it. The major hope must centre upon the scheme which the London and Home Counties Traffic Advisory Committee propounded in July last for a common fund and a common management to embrace all the local passenger-carrying agencies within the London traffic area. With such a scheme the company's tramways could hope to find a place in which they could continue usefully to serve the public, and in which they might be able to earn a share of the common fund commensurate with their needs. The report and accounts were adopted.

Telegraph Construction and Maintenance Co., Ltd.

The Earl of Selborne presided at the annual meeting on March 1st, and in moving the adoption of the report (which was dealt with in our last issue, p. 386) said that the year 1927 was an exceptionally quiet one for submarine cable makers, whereas in 1926 there was a series of orders leading to the manufacture of several long cables. He did not wish to minimise the strides made by wireless telegraphy in the

past year, but he maintained that there was, and always would be, room for both systems, and the advent of wireless would lead the cable companies to improve their lines of communication by the adoption of loaded cables. Referring to a suggestion made at the last annual meeting that the company might turn its attention to the manufacture of h.p. cables, he said that it was better in the interests of shareholders that the company should confine its activities for the present to submarine work. The present time was a kind of transition stage in which the respective spheres of cables and wireless were not clearly defined, but when this period was over, the company could look forward to a revival of orders, especially for loaded cable. The subsidiary company, the Selborne Plantation Co., had largely recovered from the effects of the floods referred to at the last annual meeting, and it was now steadily producing gutta percha for insulating the cores of submarine cables. Owing to the fact that the orders received and executed in 1927 were smaller than usual, it had been necessary to utilise some of the inner reserves in order to pay a dividend of 10 per cent. The reserves withdrawn were not now required for any other purpose. The report and accounts were adopted.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Broughton Copper Works (1928), Ltd.—425,000 7½ per cent. cumulative preference shares of £1 each partly paid and fully paid, Nos. 1 to 425,000. 2,000,000 ordinary shares of 1s. each fully paid, Nos. 1 to 2,000,000.

London Power Co., Ltd.—£4,000,000 5 per cent. redeemable debenture stock, issued at £97½ per cent., partly paid and fully paid (1928 issue).

Hendon Electric Supply Co., Ltd.—£200,000 5 per cent. debenture stock, issued at £97 per cent., partly paid and fully paid.

Stewarts and Lloyds of South Africa, Ltd.—300,000 6 per cent. first cumulative preference shares of £1 each, partly paid and fully paid, Nos. 1 to 300,000.

Applications have been made to the Committee to allow the following to be officially quoted:—

Lancashire Electric Light and Power Co., Ltd.—£1,000,000 5 per cent. redeemable debenture stock.

The undermentioned have been ordered to be officially quoted:—

Smith (S.) and Sons (Motor Accessories).—85,000 seven and a-half per cent. cumulative preference shares of £1 each, fully paid, Nos. 415,001 to 500,000.

New Issue.

Broughton Copper Works (1928), *Ltd.*—This company was recently formed to take over the businesses of the Broughton Copper Co., Ltd., and John Bibby & Co. (Garston), Ltd., and last week made an issue of 425,000 7½ per cent. cumulative preference shares of £1 each and 1,275,000 ordinary shares of 1s. each. In addition the capital of the company comprises 725,000 1s. ordinary shares, which form part of the purchase price, the balance being £552,500 in cash.

Underground Electric Railways Co. of London, Ltd.

The total income for the past year was £958,303, an increase of £154,190, and the net receipts were £884,844, an increase of £135,543. After adding £145,092 brought forward and meeting charges there is a balance of £423,205. The total ordinary dividend is 5 per cent. (against 1½ per cent.) and £169,761 is carried forward. The book value of the company's investments was increased by £378,082, and the temporary loan from bankers was reduced by £60,000 to £700,000. The annual meeting was held on Wednesday last.

Hydro-Electric Securities Corporation.

This Canadian company has issued, for information only, particulars of its capitalisation, objects, &c. It has $30,000,000 of "A" and $20,000,000 of "B" 5 per cent. cumulative participating preferred stock, and 2,000,000 common shares of no par value. Of this the whole of the "B" shares have been issued, and 420,838 of the common shares. The company was formed to acquire interests in public utility enterprises, and its principal holdings are in the Société International d'Energie Hydro Electrique ("Sidro"), the Barcelona Traction, Light & Power Co., Ltd., the Rio de Janeiro Tramway, Light & Power Co., and many large United States undertakings. Messrs. A. Lowenstein, A. Pam and F. A. Szarvasy have been appointed from the board to advise upon securities to be acquired. Mr. H. F. Parshall, D.Sc., is consulting engineer and technical adviser.

Mather & Platt, Ltd.

The annual meeting was held on February 29th, when Mr. L. E. Mather (chairman), who presided, said that although the profit was reduced, the same dividend and bonus were recommended. Their expectations regarding work from the collieries had been disappointed; very little new electrical or pumping plant had been installed. The depression in the textile trades had also had a bad effect, and competition was keener than ever before in all branches; therefore the company was to be congratulated that the profit had been so little reduced. Mr. Mather referred with satisfaction to the various industrial conferences which were now being held, hailing them as a sign of better relations between employers and employés. Their trading with Russia had proved satisfactory, and all plant had been paid for; unfortunately, political difficulties during the past year had prevented further contracts, which had had a bad effect upon the company's profits. He anxiously looked forward to a renewal of trade relations with Russia; they had sent a technical representative to Moscow, where he would remain for some months. The speaker had recently visited East Africa and the Sudan, where there were prospects of future business. In conclusion, Mr. Mather called for the support of British manufacturers by public authorities, stating that they should make a thorough study of conditions in competing countries before awarding contracts.

West London & Provincial Electric & General Trust, Ltd.

At an extraordinary meeting on March 2nd resolutions were passed providing for doubling the capital by the creation of 30,000 new shares of £5 each; for converting the increased capital into £120,000 of 5 per cent. cumulative preference stock and £180,000 of ordinary stock; and empowering the directors to capitalise part of the reserve fund. The chairman (Mr. H. Kahn) stated that it was proposed to issue the new shares at par to the stockholders in the proportion of one new share for each one held. £75,000 of the reserve would be used in crediting £2 10s. of the £5 payable for each share, leaving a balance of £2 10s. payable on application. After the £5 shares had been sub-divided and converted into stock, the holder of £100 ordinary stock would eventually be entitled to receive £80 of preference stock and £20 of ordinary stock for a total payment of £50.

Metropolitan Electric Supply Co., Ltd.

The report for the past year states that the capital expenditure was £137,039 in the London area and £156,544 in the Western area. The gross revenue rose from £789,831 to £882,934, while the working expenses fell from £536,776 to £526,705. The amount carried to net revenue account is £356,229, and, with the addition of the balance brought forward and other income, a total of £416,219 is available. After meeting debenture charges, preference dividend, &c., a final dividend at the rate of 12 per cent. per annum is to be paid on the ordinary shares, making 9 per cent. for the year, and a balance of £83,508 is carried forward. The outstanding liability on the 5 per cent. extension debentures, 1917, was discharged during the year. The connections rose by 19,945 kW to 127,439 kW. Meeting: March 14th.

Hastings and District Electric Tramways Co., Ltd.

An extraordinary meeting was held on February 29th to consider a resolution raising the directors' borrowing powers from £300,000 to £450,000. Mr. H. Kahn, who presided, said that the conversion of the system to railless traction necessitated further capital. It was proposed to raise this by an issue of £200,000 of debentures ranking *pari passu* with the existing debentures. In consideration of their consent the holders of the existing debentures would have their rate of interest raised from 4½ to 5 per cent. as from April 1st, 1929. The directors proposed to issue forthwith £130,000 of 7 per cent. notes secured upon £260,000 of the debentures. The resolution was carried, and subsequently approved by a meeting of debenture holders.

Westminster Electric Supply Corporation, Ltd.

Speaking at the annual meeting, on February 29th, the chairman (Lord Wantage) said that the energy sold during 1927 showed an advance of 10 million kWh over 1926. The employés' pension fund commenced to operate on January 1st, and in future the company would contribute, with employés, sufficient to provide pensions upon an agreed scale; from last year's profits it was proposed to allocate £15,000. The company had reduced its prices, and that benefit to the consumers would also prove advantageous to the shareholders. The chairman made reference to the company's new showrooms in Victoria Street, which, he said, would materially assist in increasing sales.

Chiswick Electricity Supply Corporation, Ltd.

Addressing the shareholders at last week's annual meeting, the chairman (Mr. H. Kahn) pointed to the steady progress of the company, and referred to the criticism of the prices charged by electricity supply companies. He said that it had to be borne in mind that for years the companies were able to earn only a meagre return upon their capital. In their own case the average rate of dividend paid from the inception of the company, in 1900, was under 7 per cent. The consumers participated in any balance remaining after a 10 per cent. dividend had been paid.

Lancashire United Transport and Power Co.

Sir Arthur Stanley, G.B.E. (chairman), presiding at the annual meeting on February 28th, said that the shareholders were to be congratulated upon the results obtained during the past year, especially upon the increase in the revenue from motor-'bus services. During the next few years they had to face heavy expenditure upon the renewal and reconstruction of the tramways, and upon additional motor vehicles. On some of the routes trams might be replaced by motor-'buses, and that would involve the writing down of capital values. He had every hope that the undertaking would continue to progress.

Metropolitan-Vickers Electrical Co., Ltd.

The directors recommend a dividend of 6 per cent. on the ordinary shares for the past year, as compared with 8 per cent. for 1926.

The report for 1927 says that although the output constituted a record, owing to the continued depression in prices the profits did not increase proportionately. Several changes in the board are noted. During the year Sir Mark Webster Jenkinson and Capt. R. S. Hilton resigned. Sir E. Wyldbore, Mr. J. S. Peck, and Mr. B. D. F. Docker have been appointed to the board, and Mr. Docker has been elected deputy-chairman. Meeting, March 16th.

Delhi Electric Tramways and Lighting Co., Ltd.

An extraordinary meeting is to be held on March 14th to consider a scheme for the consolidation of the capital. The directors propose to issue for subscription by the preferred shareholders (at par) 20,000 6 per cent. participating preference shares. This will raise the capital to £150,000 in 120,000 preference shares and 30,000 ordinary shares, which are then to be converted into ordinary shares of one class. The issue to preferred shareholders compensates them for the loss of their preferential rights.

Torquay Tramways Co., Ltd.

In the course of his remarks at last week's annual meeting, the chairman (Mr. W. B. Cownie) referred to the railway companies' Road Transport Bills, and said that he did not think that the companies would attempt to compete with such undertakings as their subsidiary 'bus company except on economic lines. Moreover, one could hardly believe that the authorities would grant licences to vehicles which were not required and would increase the cost of road maintenance.

Tottenham District Light, Heat and Power Co.

Speaking at the recent annual meeting, the chairman (Mr. H. Woodall) said that the company's output of electricity during the past year was 23 per cent. above that of 1926. At an extraordinary meeting which followed approval was given to the promotion of a Bill which, among other things, will change the company's title to "The Tottenham and District Gas Co.," and increase the ordinary capital by £200,000.

Midland Electric Manufacturing Co., Ltd.

The report for 1927 shows a net profit of £39,360 (against £21,010), to which is added £4,454 brought forward, making £43,814. The directors propose to pay a dividend of 10 per cent. and a bonus of 15 per cent. on the ordinary shares; £10,000 is placed to reserve, and £14,314 is carried forward. The dividend for the preceding seven-month period was at the rate of 7½ per cent. per annum.

Isle of Thanet Electric Supply Co., Ltd.

The revenue for the past year was £160,757, and the gross profit £72,554. After making various provisions, including £30,000 to general reserve and depreciation account, and adding interest and balance brought forward, there remains £27,455. It is proposed to raise the ordinary dividend from 3 to 4 per cent., and to carry forward £4,535. Meeting: March 14th.

W. Canning & Co., Ltd.

The accounts for the year ended December 31st show a profit of £43,467, and the addition of £4,564 brought forward makes available £48,031. It is proposed to distribute this as follows: A dividend of 10 per cent. and a bonus of 6d. per share on the ordinary shares; to reserve fund, £10,000; to employés' benevolent trust fund, £1,000; carrying forward £7,031.

Crompton-Parkinson, Ltd.

The board has declared an interim dividend at the rate of 8 per cent. per annum on the cumulative preference shares for the nine months ended December 31st, 1927, payable on March 31st, 1928, and an interim dividend at the rate of 2s. 6d. per share on the deferred ordinary shares for the period ended December 31st. 1927, both payable on March 31st.

South London Electric Supply Corporation, Ltd.

The directors recommend a final dividend of 5½ per cent. on the ordinary shares, making 8½ per cent. for the year. In 1926 an interim dividend of 5 per cent. was paid on the capital then existing and a final dividend of £5 17s. 6d. per cent. was paid on the increased capital.

South Metropolitan Electric Light and Power Co., Ltd.

The final ordinary dividend is 5 1/12th per cent., making 8 1/12th per cent. for the year.. In the preceding year an interim distribution of 5 per cent. was made on the capital then existing, and 6 per cent. was paid on the capital as increased during the year.

County of London Electric Supply Co., Ltd.

A final dividend of 4½ per cent. (making 7½ per cent. for the year) has been declared on the ordinary shares. For 1926 5 per cent. was declared on the original capital and 5 per cent. on the whole of the increased capital.

Western Telegraph Co., Ltd.

The directors have declared the second quarterly interim dividend of 5s. per share, free of tax.

English Electric Co., Ltd.

The directors announce that the financial results of the past year do not permit of the payment of the dividend on the 6 per cent. preference shares. In 1926 half of the dividend was paid.

Vickers, Ltd.

Final dividends of 2½ per cent. have been declared on the preferred stock, preference shares, and cumulative preference shares, free of tax in the case of the last.

Brazilian Traction, Light and Power Co., Ltd.

A quarterly dividend of 1½ per cent. has been declared on the cumulative preference shares.

Pennsylvania Water and Power Co.

A dividend of $½ per share has been declared on the common shares for the current quarter.

Stocks and Shares.

MONDAY EVENING.

BUSINESS has again been very active in practically every section of the Stock Exchange during the past week. Gilt-edged stocks were well maintained, the possibility of a Budget surplus more than counteracting the effect of the new Australian Government Loan. The foreign railway market has continued to be active, and a certain amount of speculative (very speculative!) buying of the bonds of the Russian State Railways has been in evidence, a corollary to the rise in Russo-Asiatics and Lenas. Industrials have, needless to say, continued well in the limelight, and considerably more interest has been evinced in the oil market. Rubbers have been a little less prostrate on possibilities of Dutch co-operation in the matter of restriction.

Home Rails.

The passing of the second reading of the Railways Bill in the House of Commons failed to create much interest in the Home Railway Market, and price changes have been few and far between. The same can be said of the electrified lines. Metropolitans are unchanged, and Districts are a fraction off. There was more activity in Underground ordinaries on the report, with the result that the shares have been "bumping" up against the 22s. mark practically all the week. The income has shed a point to 107.

Electricity Supply.

Activity in the Home Electrics has in no way diminished, and dealers report bumper business each day. Metropolitans, after their spectacular rise of the previous week, have inclined to tiredness, and have sagged off to about 44s. 6d. Counties have been extremely active, and are 2s. to the good at 36s. 6d., after being at one time 37s. 6d. bid. Bournemouth and Poole ordinary have been aggressively bid for on stock bonus talk. As the combined reserves exceed the issued share capital, a "melon cutting" is not impossible. The shares have reached 68s., a rise of 4s. on the week. Dealings have started in the London Power new 5 per cent. debenture stock, which has changed hands actively round about 1 premium. Dealings are expected to commence during the next few days in the new 5 per cent. debenture stock of the Hendon Electric Supply Company, which is now being offered to shareholders at 97. Sevenoaks shareholders are being offered 42s. 6d. for the £1 ordinary shares, an offer which they should have no hesitation in accepting, as the nominal quotation up to a fortnight ago was in the neighbourhood of 27s. They can be congratulated on a very sweet little profit. The offer has been made *via* the secretary of the company, and the identity of the actual purchaser is not disclosed. Turning to bulk supply concerns, the Newcastle dividend (6 per cent. against 5 per cent.) caused a little disappointment, as the market was anticipating a return to the "pre-strike" rate of 7 per cent. The report, which should be out in about a week, is being looked forward to with interest, as it is thought possible that a new issue on bonus terms to shareholders is not improbable. The shares, which prior to the dividend touched 26s., have reacted slightly. Yorkshires are unchanged. The new have been actively dealt in, and touched 7s. 3d. premium, afterwards reacting a little to 6s. 6d. premium, equal to 30s. 6d. for the fully-paid shares. Scottish Power have also been active, and are better at 29s., with the new 27s. 6d. The Isle of Thanet report was to hand over the week-end. The ordinary are to receive 4 per cent., as against 3 per cent. for 1926. This is considered very unsatisfactory by certain shareholders in view of the large amount placed to reserves, and interesting developments may follow. The ordinaries have receded to 1s. 6d., and the 6 per cent. preference to 22s. 6d., as against 22s. and 24s. prior to the issue of the report. The West London and Provincial Electric Trust bonus scheme has been passed by the proprietors, and the stock has spurted to the 200 mark in consequence. Beaver Trust (another little electric lighting trust) shares have appreciated to 23s. 6d. on hopes of an interim dividend in the near future.

Overseas Electrical Undertakings.

There is no outstanding feature to report in this section, although it has not been entirely without interest. The reason of the rise in Delhi Electric preferred reported here last week has been disclosed by the issue of a scheme to consolidate the two classes of shares into one class only. If the scheme is carried preferred holders will be given the right to subscribe at 20s. for new preferred on the basis of 1 in 5. The shares have further appreciated to 53s. in consequence. Cawnpore Electrics have been dealt in, the basis being 28s. As 10 per cent. per annum is being regularly paid, this share is not considered dear in market circles. Perak River Hydro-Electric 7 per cent. debenture was in inquiry at 106, but the shares are unchanged. There was as usual a good deal doing in Atlas Light and Power without, however, changing prices, with the exception of the 6 per cent. debenture stock, which is now 104. Tokyo 6 per cent. debentures were again on the dull side at 95. Mexican Lights were fairly active, and closed a point up at 67½. The three debentures of the Monterey Railway, Light and Power Co., of which there has been some mysterious outside buying, were all better at 57, 14 and 5 respectively. Southern Brazil Electric 6 per cent. debentures were a good market, touching 78½, a rise of some three points on the week.

Tramways.

The London Suburban Traction meeting was a rather mournful affair, with a "triumph of experience over hope" sort of feeling, and as a result things have been lifeless, and prices have sagged away, the preference being no better than 6s. 6d. Lancashire Transports at 8s. 6d. are down a little in spite of the cheerful meeting and the announcement that the company will shortly have 150 'buses in commission, and that running agreements are being entered into with various local authorities who operate 'buses in the neighbourhood. Yorkshire Trams, both ordinary and preferred, are dull on the report. Again no dividend is being paid on the ordinaries, and all reserves are being utilised to write down the tramway assets. Brazilian Tractions recovered some of their drop of the previous week, and at 208½ are three points to the good. The preference are 172. Anglo-Argentine Trams preferred shed 1s. 3d. at 3 13-16, the only price alteration to report of this concern. British Electric Traction deferred was marked to 515, partly on the British Automobile Traction-Tillings deal, and partly on the nearness of the report. British Columbia Electric Railway issues were all unchanged, although a good deal of business has taken place. La Platas at 4s. 6d. were a little off colour. Pernambucos at 6s. 9d., with the preference 16s. 6d., were harder, as were Buenos Aires Town and Docks Tram ordinary at 7s. 6d. in anticipation of the report.

Cables.

Rumours of a breakdown in the cable *cum* wireless negotiations caused a set-back in the Telegraph and Telephone Market early in the week. The chief sufferers were Marconis, in which there still exists a weak bull account. They were at one time as low as 53s., from which, later, they recovered some 3s. on the publication of an official announcement that there has been no breakdown in negotiations which were still in being. They opened strong to-day for the "New 90," and are now 58s. bid. Somewhat similar rumours were spread about a few weeks ago, but readers of this column were advised to give such rumours little credence, and to ignore minor price fluctuations. That advice still holds. Marconi Marines, which have been recommended in various quarters, have been a good market, and are now practically 40s. Canadian Marconis are also better at 13s. 6d., after a little initial weakness. The Submarine group have, generally speaking, been on the dull side, fluctuating within narrow limits. Prices are in practically every case unchanged.

Electrical Equipment.

This market has been partly sun and partly shade, with the shade predominating. The reduction of the ordinary dividend of Metropolitan-Vickers from 8 per cent. to 6 per cent. came as a nasty jar, especially as most people had been looking forward to an increase in view of the strong balance sheet position and margin by which the 8 per cent. was earned for 1927. A certain amount of bear covering helped the price to drop gently, and the shares are now 29s. 9d., showing a loss of only 9d. on the week. Another jar, although not such an unexpected one, was the announcement that no dividend on English Electric preference would be forthcoming for the past year. The dividend is now 9 per cent. in arrears, and the shares sagged off to 10s. 6d., with the ordinaries dull at 6s. 9d. in sympathy. Market circles are of opinion that they have not yet grounded. Turning to the brighter side, both the preference and preferred of Crompton-Parkinson were in demand on the declaration of the initial interim dividend of 12½ per cent. actual on the deferred, which, by the way, are all privately held. The 6 per cent. preferred are now 18s., and are expected, in the City, to reach parity before long, as the dividend is covered on current earnings some four or five times over. Power Securities ordinary at 28s., and the participating preference at 4s., were both in demand on the excellent report, and British Aluminium have been active on increased dividend hopes, and at one time touched 54s., from which they relapsed somewhat, as a result of a little end account profit taking. Babcock & Wilcox, at practically 70s., have consolidated their gain of the previous week, and of cable manufacturing concerns, both Henleys and Callenders have been in active inquiry.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Dividend. 1925.	Dividend. 1926.	Price Mar. 5. 1928.	Rise or fall.	Yield. p.c.
	£					
Bournemouth and Poole	1	14†	14†	68/-	+4/-	4 2 4
Brompton Ordinary	1	10	8½	25/6	+6d.	5 9 10
Charing Cross Ordinary	1	15	8½	26/6	—	5 5 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	8½	26/-	—	5 7 8
City of London	1	15	10	31/6	—	4 8 11
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	34/-	—	4 14 2
County of London	1	15	7½	26/6	+2/-	3 17 9
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundsons' Ordinary	1	8	10	67/6	—	2 19 2
do. 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	48/6	+3/-	4 14 6
Kensington Ordinary	1	15	8	26/-	—	5 7 8
Lancs. Light and Power	1	7½	7½	28/6	+1/-	5 5 3
London Electric	1	10	8½	25/6	—	5 9 10
do. do. 6% Pref.	5	6	6	5½	—	5 8 2
Metropolitan	1	11	8	41/6	—1/6	4 0 10
do. 4½% Pref.	1	4½	4½	17/-	—	5 8 6
Midland Counties	1	6	6	25/6	—	5 2 0
Newcastle-on-Tyne Ordinary ...	1	7	5	25/-	—9d.	4 16 0
do. 5% Pref. ...	1	5	5	18/-	—	5 10 0
do. 7% Pref. ...	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	17½	8	27/-	—	5 8 8
South London	1	15	8½	26/-	+6d.	5 7 8
South Metropolitan Pref.	1	7	7	1½	—	6 8 0
Urban Ordinary	1	7	7	55/-	+5/-	2 1 0
do. 6% Pref.	1	6	6	1 1/16	—	5 13 0
Westminster Ordinary	1	15	8½	26/-	—	5 7 8
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	22/-	+1½d.	6 16 4
Yorkshire Elec.	1	8	8	32/-x all	—	5 0 0

Home Rails.

Central London Ord. Assented ...	Stock	4	4	74xd	—	5 8 1
Metropolitan	,,	5	3	66	—	4 10 11
do. District	,,	3½	3½	70	—½	5 14 4
Underground Electric	£1	Nil	1½	22/-	+6d.	4 10 11
do. do. Income ...	Bonds	6	6	107	—1	5 12 2

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	94½	—	6 7 0
do Def.	,,	1½	1½	23	—	6 7 8
Automatic Telephone	1	3	10	47/9	—1/-	4 3 8
Chili Telephone	5	5	6	7⅞	—	3 18 3
Eastern Extension	10	10	10	15½	—½	*6 9 0
Eastern Tel. Ord.	Stock	10	10	145	—	*6 17 11
Globe Tel. and T. Ord.	10	10	10	15½	+½	*6 11 2
do. do. Pref.	10	6	6	10½	—	5 17 1
Great Northern Tel.	10	20	20	39	—	5 2 7
Indo-European	25	8½	10	35	—	*6 1 5
Marconi	10/-	Nil	5	58/-	+1/-	1 14 6
Marconi-Marine	1	7½	8½	40/-	+1/-	4 7 6
Oriental Telephone Ord.	1	12	12	51/3	—	*4 13 6
United R. Plate Tel.	5	8	8	10⅜	—	*3 15 3
Western Telegraph	10	10	10	14	—	*7 2 10

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8¾	—	7 6 8
do. do. 2nd Pref. ...	5	6	6	8 1/32	—1/16	7 17 4
do. do. 5% Deb. ...	Stock	5	5	80	—	6 5 0
British Electric Traction Def. Ord.	,,	—	—	515	+5	... ...
do. do. 8% Pref. Ord.	,,	7	8	194½	—	6 8 6
Brazil Traction	100	5	6	208½	+3	2 17 6
Brit. Columbia Elec. Rly. Pcs. ...	Stock	5	5	93½	—	5 6 11
do. do. Preferred ...	,,	6½	6½	160½	—	*3 17 11
do. do. Deferred ...	,,	8	8	204½	—	*3 18 3
do. do. Deb.... ...	,,	4½	4½	84½	—	5 0 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	6/6	—6d.	... ...
London United Tram Deb. ...	Stock	4	4	85½	—	7 4 2
Mexico Trams, 5% Bonds	—	5	5	80	—1	6 7 5
Mexican Light Common	100	Nil	Nil	67½	+1	... ...
do. 7% Pref...	100	Nil	Nil	78	—	... ...
do. 1st Bonds	—	5	5	79½	—	6 9 4
Yorkshire (West Riding)	1	5	—	7/6	—	... ...

Manufacturing Companies.

Babcock & Wilcox	1	12	12	69/-	—	3 15 4
British Aluminium Ord.	1	12½	10	53 6	+1/3	*3 18 4
British Elec. Transformer Pref. ...	1	7	7	18/3	—	7 13 6
British Insulated Ord.	1	15	15	4½	+ 1/16	3 12 8
Brush Ord.	1	10	10	29/-	—	6 17 11
Callenders	1	15	15	4½	+ 1/16	3 12 8
do. 6½% Pref.	1	6½	6½	23/-	—	5 9 5
Crompton Parkinson Pref. Ord. ...	1	—	—	17/6	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	90	—	5 11 0
Electric Construction	1	10	7½	26/-	—	5 15 5
Enfield Cable Pref.	1	7½	7½	26/3	—	5 14 3
English Electric	1	Nil	Nil	8/6	—1/-	... ...
do. do. Pref. ...	1	6	3	11/6	—1/-	... ...
Gen. Elec. Pref.	1	6½	6½	24/-	—	5 8 4
do. Ord.	1	7½	7½	26/-	—	4 3 4
Henley	1	20	25	5½	—	4 10 11
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	Nil	13/-	—	... ...
Johnson & Phillips	1	17½	12½	63/9	—	4 12 7
Met.-Vickers Ord.	1	8	8	29/6	—1/-	4 1 4
do. Pref.	2	8	8	28	—	6 1 11
Siemens Ord.	1	7	7½	31/6	—	4 15 3
Telegraph Construction	12	10	10	94½	—	*4 19 0

* Dividends paid free of Income Tax.
† 4% of which was Tax Free.

The British Industries Fair.—IV.

Electrical Visitors to the Birmingham Section. Further Exhibits in both Sections.

THE Fair closed on Friday last after enjoying a success which is claimed to be unprecedented in its history.

Towards the close of the show inquiries were made among the electrical exhibitors regarding the amount of business done, their opinions of the Fair, and future prospects. Upon their remarks the following notes are based.

Satisfaction was general, and although it was qualified in a few instances, only one firm approached was actually disappointed with the results. The last word is capable of a number of interpretations. To some it implies firm orders, but shoals of immediate orders cannot be expected in an exhibition of this nature. This is especially true in connection with the heavier products; nobody will place an order for a large switchboard, a 500-h.p. motor, or several miles of cable merely by seeing these or parts of these on a stand. Nevertheless, the interest aroused may be so strong that if the goods are really what they are claimed to be, an order will almost inevitably result. Many firms reported the receipt of inquiries of such a substantial nature that they had no doubt that customers had been found for their products. One of the best inquiries which came to our notice was for no fewer than 50 pulverising plants from an industrial concern of undoubted standing. This alone was said to be worth about £50,000. Sound inquiries for as many more of the same plants had been received.

Other branches of the company's business—especially the heavy lines—had also booked useful inquiries. This company's experience may be useful: it was found that business during the first two days was brisk; later there was a slump, but a revival set in during the second week and continued almost to the end. One switchgear firm was particularly pleased with the number of inquiries for the export market—some valued at as much as £7,000. Another company which already had a large stand announced its intention of taking double the space next year. It showed three new domestic lines which attracted a great deal of interest; for one of them 60 per cent. of the municipal supply engineers who visited the stand asked for samples to be submitted. Some manufacturers of switchgear, lighting fittings, &c., stated that they had got into touch with many new prospective customers. They recalled the fact that a customer secured at a previous Fair had repaid them for their trouble and expense many times over. Another aspect of the Fair was a source of satisfaction to a motor firm; they had met customers for the first time whom they had been supplying for years, and they consider that this has a valuable effect. Apart from that the business done was better than at any previous Fair. The last point was also stressed by a company making tumbler switches and other installation fittings. Over 100 inquiries which they think will be fruitful were received by a well-known switchgear company; they were approached by other manufacturers who consider standardising our informant's products on their own machines. One of the leading electrical companies expressed the highest satisfaction, stating that as well as inquiries many orders had been received. The day of the I.M.E.A. visit was considered the best day of the period, which illustrates another useful feature of the Fair. It was suggested on this stand that it might be preferable to exclude the public for the first fortnight and then run the Fair for another week as an exhibition of public interest. Inquiries for domestic appliances and soldering irons were received by another firm from abroad—including Holland, New Zealand and the United States. Several new and important customers were secured as a result of last year's Fair. A manufacturer of heavy and medium-size electrical machinery computed that 80 per cent. of the inquiries received were good ones and likely to turn into orders.

Many exhibitors did not hesitate to use superlatives—one of them said that he was "overwhelmingly satisfied" with the sale of and inquiries for his electric fires, while another said that as a means of advertising, the Fair was almost as good as the ELECTRICAL REVIEW.

Altogether about forty of the exhibitors were interviewed, and the sentiments of practically all of them were in consonance with the foregoing remarks. We think that it is not too much to say that the Fair has justified its existence and must continue to expand.

Electrical Lunch at Birmingham.

On Thursday last week there were delegations to the Birmingham Section from the following organisations, who were the guests at luncheon of the Fair authorities:—The Incorporated Municipal Electrical Association the British Electrical Development Association, the Incorporated Association of Electric Power Companies, the Provincial Electric Supply Association, the Municipal Tramway and Transport Association (Inc.), the Tramways and Light Railways Association, and the Institute of Patentees (Inc.).

Mr. H. H. BERRY, chairman of the Electrical Advisory Committee, presided, and he was supported by, among others, Lord Askwith (president of the Institution of Patentees), the Lord Mayor of Birmingham (Alderman A. H. James), Mr. F. W. Purse (president of the I.M.E.A.), and Mr. J. S. Highfield (vice-president of the Incorporated Association of Electric Power Companies).

The CHAIRMAN, in submitting the toast "The Electrical Industry and Visiting Associations," said he hoped that visitors of the electrical industry would consummate the object of their visit by making a selection of the goods displayed and placing orders, if not immediately, at least a little later in the year. His Committee had had under serious consideration the question whether the period of the Fair was a suitable one, and the electrical section had decided to take a referendum of its exhibitors on the matter because one of the main objects of the Fair was to attract the foreign buyers who were so necessary to them in order that they might keep their prices down to those in the home market. The referendum had been circulated to all the manufacturers, and he had no doubt that the result of it would receive in due course serious consideration by the Fair authorities. The Fair was making headway, and it was the determination of the Fair Council to make it second to none in the world, including Leipzig, whose Fair had been established hundreds of years. The task of making the Fair more important than Leipzig was not, he thought, an insuperable one. In that greatly enlarged Fair the electrical industries occupied 20 per cent. of the whole space. In linking Lord Askwith's name with the toast, Mr. Berry illustrated what he described as the most amazing record of British inventors and the benefit of their work to mankind, and urged that they should support Lord Askwith in the work which he had undertaken as president of the Institute of Patentees. Mr. Berry paid a high tribute to the work of Mr. E. J. Jennings, secretary of the Birmingham Corporation Electric Supply Department, as secretary of the Electrical Advisory Committee of the Fair.

Lord ASKWITH, in responding, referred at some length to the importance of invention in this country, and of advances made during the last 50 years. The Institute of Patentees, he said, was started just after the war, with a score of people, but now had 2,000 members; it held exhibitions and helped inventors in a way that enabled the inventor to become known to a wider circle. It was invaluable to the older industries, because although there

might be a great deal of chaff, they might discover a pearl among the inventions so disclosed. There had been more inventions since 1840 than in the 1,840 years previous to it. The electrical industry brought itself particularly home to the lives of the people. He asked a lady the other day what she found the chief care of her life, and she replied that it was keeping the house moderately clean. What an assistance to every housewife electricity must bring to the home! He was told, and he felt that that would reflect itself in the supply industry.

Mr. J. S. Highfield urged the need for a protected market in this country, saying it would result in lowering still more the cost of electrical goods. As regarded turbine plant, he would like to see more machines built to a standard design, and fewer changes; otherwise he did not see any chance of manufacturers making any profit out of turbines.

Wild-Barfield Furnaces, &c.

A "Magnet" Baking Oven.

General Industrial Apparatus.

A Display of Domestic Appliances.

The Birmingham Corporation Electric Supply Department's Stands.

too, that it was prolonging life. After alluding to the important part played by electricity in shipping, aviation and transport, Lord Askwith said that an old Chinese proverb held that "It is easy to open a shop, but hard to keep it open." He thought that the Fair was one of the best methods yet devised for keeping their shops open. The advantage manufacturers gained from the Fairs would lead to their support and improvement as years went by.

A response was also made by Mr. F. W. Purse, who congratulated the promoters on the advance of the Fair, and spoke of the difference between the big electrical section of to-day and the position three years ago, when there was only an odd electrical stand here and there. He understood that orders had been very satisfactory,

General.

The reports from both sections indicate more buyers and better business than at any previous Fair. The attendance at London was stated to be 103,586 and that at Birmingham 103,000. The Birmingham authorities estimate the amount of business done at 5¼ million pounds. Many exhibitors have asked for increased space at next year's Fair, and applications from firms who have not exhibited before have been received. The Birmingham Chamber of Commerce will shortly consider a scheme for the further enlargement of the Castle Bromwich buildings, and it is stated that another three or four acres will be taken in.

In our "Correspondence" columns to-day there are several letters dealing with various aspects of the Fair.

Some of the Exhibits.

Details and Illustrations.

Young, Osmond & Young, Ltd.

Tubular heaters of various sizes and shapes were exhibited on this stand. Two notable items were a car-bonnet warmer

Fig. 20.—A Car-bonnet Warmer.

and a nickel-plated towel rail with a low loading. The former is illustrated in fig. 20.

Davidson & Co., Ltd.

A representative selection of "Sirocco" fans was shown on this stand. Fans for ventilation, dust removal, high-pressure blast, and for a variety of other purposes were exhibited, as well as such accessories as steam air heaters and dust collectors. Two models of the company's flue-dust collector were shown. This collector has been installed in power stations in all parts of the world. A fascinating and spectacular exhibit was the "Aerostat," in which nine revolving nozzles each held a ball in suspension.

Brook Motors, Ltd.

Alternating-current motors in sizes from 1 to 200 h.p., suitable for working on single-, two-, or three-phase supply, of the ordinary commercial type were shown by this company. The special machines exhibited included a loom motor, buffing motor, and crane motors for working haulage gear, or cranes, and pipe-ventilated motors. In addition there was an exhibit of brush-lifting and short-circuiting gear on an enlarged scale, also showing in half-section a motor built in metal, cut through the middle so as to expose all the parts, and these were tinted so that a person unacquainted with electrical matters could understand the construction. A small motor in section also appeared to show the method of winding and type of bearings.

Rapid Magnetting Machine Co., Ltd.

Several examples of the company's separators, lifting magnets, &c., were on view. The standard-type separator is chiefly used for dealing with swarfe from machining processes. The model shown in fig. 21 is fitted with a dynamo for energising the magnets, but if a suitable d.c. supply is available a suitable winding is substituted. The material is passed through a sieve and fed into the hopper, and the delivery of the treated material can be adjusted according to its nature. The feed tray beneath the hopper is jigged sideways; the delivery end is serrated and distributes the material evenly over the face of the revolving brass drum inside

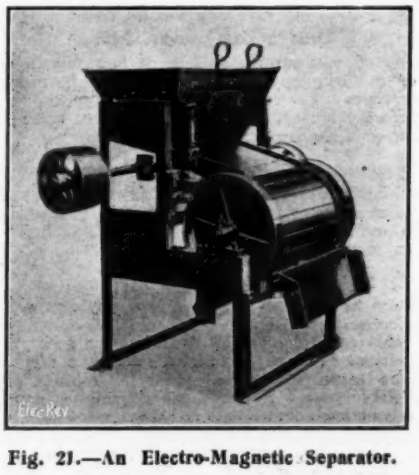


Fig. 21.—An Electro-Magnetic Separator.

which the magnets are fitted, giving a field extending round the front half of the drum. On being caught, the iron is carried round to the back of the machine, being released on leaving the magnetic field. This machine is made in four sizes with outputs ranging from 2 cwt. to 2 tons per day. An example of an electro-magnetic shute was shown. This embodies magnetised bars placed at such an angle that the material under treatment passes over them at a reasonable speed. Several small separating magnets were shown, as well as models of lifting magnets.

Ray Engineering Co.

This firm displayed a complete range of its switchboards for country-house installations, and samples of standard open-type switchgear and battery-charging units. All the switchgear components are machined to jigs, making like components interchangeable throughout the whole range.

Moorwoods, Ltd.

In addition to a few examples of its electric fires, this company showed its two cookers. These are built on similar lines with total loadings of 7,900 W and 6,000 W. A special feature of the appliances is the enclosed hot-cupboard with drop-down door. The hob contains in the larger size two enclosed boiling plates and a combined grill and boiler; in the smaller size there is one hot plate. The hob is hinged at the

Fig. 22.—A "Moorwood" Cooker."

back to enable it to be swung back for cleaning purposes. Each element is controlled by a rotary three-heat switch. The smaller size is illustrated in fig. 22.

International Combustion, Ltd.

This company shared a stand with its associates, the Underfeed Stoker Co., Ltd., and Coal Oil Extraction, Ltd. The company's own exhibits comprised a pulverised-fuel feeder, a special design brought out since the last Fair; an "R" burner, which, by greatly reducing the flame length, has made it possible to install a smaller combustion chamber than hitherto provided, altering very considerably the whole design of the "Lopulco" system; "Murray" tubes and heaters for lining combustion chamber walls, taking the place of the older-fashioned refractories and increasing the evaporation of the whole unit; a "Raymond" mill; and methods of showing the working of the "Lopulco" system. The Underfeed Stoker Co., Ltd., displayed parts of the grate of the "A" travelling grate stoker (for water-tube boilers); parts of the new "L" stoker (also for water-tube boilers), which, during the past year, has been ordered for over 20 plants, including the Barking station of the County of London Electric Supply Co., Ltd.; an element of the "Usco" air heater, indicating the method of operation; and parts of the "Detrick Usco" suspended arch. Coal Oil Extraction, Ltd., showed specimens of oil, &c., taken from its carbonisation process.

Bull Motors, Ltd.

An interesting collection of products was staged by this company. Among them was the special motor generator designed for ships' radio work giving 0.5 A d.c. at 2,400 V (*vide* ELEC. REV., May 6th, 1927, p. 741). This machine is claimed to be sparkless at all loads. Another exhibit was a 300-A single-operator arc-welding set. There were a number of standard a.c. motors with vacuum-impregnated insulation. The d.c. machines included a special motor for refuse-collecting vehicles designed in consonance with a low loading line, and a 50-h.p. series-wound trolley-'bus motor said to run without sparking at three times full load; a special eddy-current brake is being developed for this machine.

F. Gilman (B.S.T.), Ltd.

This company exhibited, for the first time, a shot-hole drilling machine operated by means of electric drive. This tool embodies a joint rotary and percussive action permitting a high rate of drilling, and enabling the machine to deal with very hard substances. The company also showed coal and rock rippers operating in a similar manner, but embodying a percussive action only, and a full range of boiler-scaling devices, electric, petrol and pneumatic types and general utility tools for drilling, grinding, polishing, &c.

D.P. Battery Co., Ltd.

A special feature of this display was a number of cells representing batteries supplied to overseas markets. The cells shown ranged from small h.t. radio cells in moulded glass boxes to one weighing approximately 2 tons, with a capacity of 10,000 Ah. The latter is one of a battery shortly to be installed at the Metropolitan Exchange, London, and batteries of approxiately the same size are at the present time being installed at one of the other London exchanges. Another exhibit was a cell as supplied to the Brisbane Exchange, Australia, in which provision has been made for doubling the capacity when required. For heavy-duty batteries the company employs a heavy type of Planté positive plate, together with its sponge-type negatives. An example of a complete battery on a double-tier stand suitable for country-house and similar installations was exhibited. In addition to stationary batteries, "Kathanode" batteries were shown, including a sample cell as supplied for two of the largest electric locomotives constructed in this country, and cells of the type fitted in the locomotives employed in the Mersey tunnel excavations, and in the special battery locomotives used for emergency purposes in the new Post Office Tube Railway. A group of six submarine cells was included on the stand. "Kathanode" submarine cells are fitted with "Faure"-type plates, and the company's patent separator, consisting of glass wool felt wrapped round the positive plate and used in conjunction with wood and perforated ebonite sheets. Many h.t. and l.t. radio batteries were also shown.

Coventry Electrical Appliances, Ltd.

Kettles, toasters, irons, fires, and other domestic electrical appliances appeared on this stand. A cheap fire of simple design shown was the "Corporation" 600-W pattern, produced in black, blue or brown finish.

London Electric Wire Co. & Smiths, Ltd.

A comprehensive display of all kinds of cables and wires appeared on this stand. Special features were the "Lecite" wiring system and various types of coils, &c., for radio work.

Sturge & Baker, Ltd.

As in previous years this company had a varied display of its bowl and reflector fires with boss-shaped elements, and, in addition, showed lighting fittings and flex-winding devices.

Electrical Power Engineering Co. (Birmingham), Ltd.

This company showed a range of its standard d.c. motors and various special types, including its epicyclic geared motor (fig. 23), polishing or buffing motors, and motor-driven

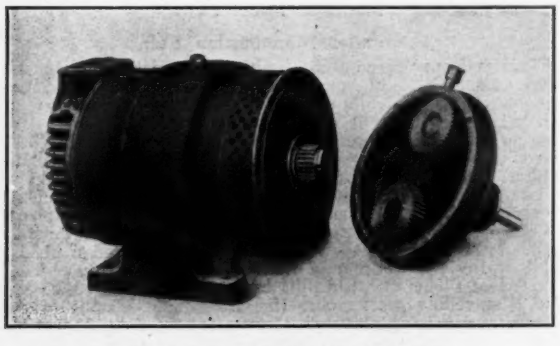


Fig. 23.—An Epicyclic Geared Motor.

pumps. Other exhibits were a battery-charging motor generator set and the "Warwick" lighting plant for private-house lighting, driven by a 2-stroke petrol engine, and fitted with a push-button starting device.

Long & Crawford, Ltd.

Switchgear and dividing boxes were shown upon this stand. The main exhibits were a panel bearing switches and fuses of the company's manufacture, and a "Metesco" ring breaker. The latter was described in our issue of November 11th last (p. 832). It was evolved for the Metropolitan Electric Supply Co.'s system as a means of connecting up large consumers. The apparatus provides for looping in and out, breaking the "ring" without interrupting the supply, isolating the consumer's transformer, and feeding the transformer from either side of the ring.

Bowen Instrument Co.

Several patterns of pyrometer were exhibited by this firm. The thermo-electric types shown included one for use in non-ferrous foundries. This is constructed as a single unit with a short thermo-couple at one end for dipping into a ladle of molten metal. The couple is lightly insulated to lengthen its life without appreciable time lag. Resistance pyrometers formed another section of the exhibit. These were in various forms suitable for foundry core-drying plant and other low-temperature purposes. In the "Pyro" radiation pyrometer shown, the radiant energy from the body under measurement is received on a lens and concentrated on a thermo-couple mounted *in vacua*. Other exhibits were optical pyrometers for numerous industrial processes and recorders. Some of the instruments were shown in actual operation in conjunction with electric furnaces exhibited by Messrs. R. M. Catterson-Smith.

Vac-Tric, Ltd.

Examples of the two models of "Vac-Tric" cleaners appeared on this stand. The first is of the usual external dust-bag type, attached to a long handle and provided with a number of accessories. The "Vac-Tric De Luxe" has a separate dust-container mounted on wheels and a long flexible hose, on the nozzle of which various implements can be fitted.

Langham Engineering Co.

Geared motors, from ¼ to 30 h.p., formed the principal part of this exhibit. The "power unit" consists of a standard medium-speed industrial motor which is fitted with a special end cover embodying a gear box containing either single- or double-reduction gearing. The gear box being integral with

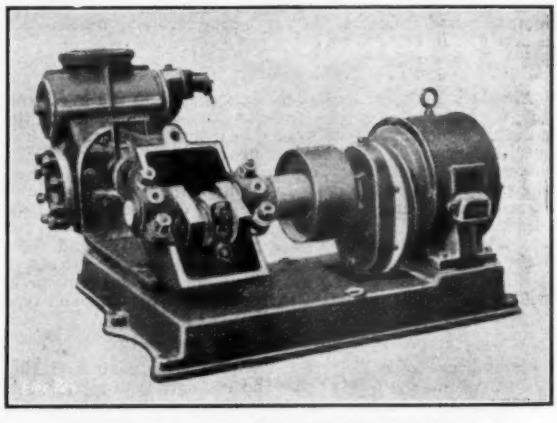


Fig. 24.—A Langham Pump Drive.

the motor, gives a neat and compact unit with perfect alignment. The reductions provided for range from one-third to one-twenty-fifth of the motor speed. Many applications of the "power units" were exhibited, and fig. 24 illustrates a typical one, a unit coupled to a high-duty "Zwicky" pump running at 75 r.p.m.

Omega Lampworks, Ltd.

All kinds of vacuum metal-filament lamps comprised the display of this company. These included opal, traction, sign and other types. The company is starting up a new factory with a capacity six times that of the present works for the production of these lamps.

Richard Johnson & Nephew, Ltd.

This exhibit comprised all kinds of iron and steel and non-ferrous wires and sections. Special items were a new rustless steel wire and a galvanised-iron wire capable of being wound around its own diameter without cracking.

Ceag, Ltd.

In addition to a display of its standard products, comprising miners' electric safety lamps and equipment for their maintenance, this company exhibited lamps for decoration purposes in various fast-sprayed colours. These are a new departure of the company's special plant for making bulbs for electric safety lamps. In addition, automobile lamps and a wide range of low-voltage battery lamps were shown on the stand. Another item was the can and barrel inspection lamp described in our issue of February 10th, p. 258.

Gramo-Radio Manufacturing Co.

The "Coruso" combined gramophone and radio receiver was this firm's main exhibit. Many novel features are embodied in this apparatus. It has two turntables, which enable music to be played with scarcely a break, and by means of a special process records can be made of broadcast music. A microphone attachment converts the machine into an announcer when necessary. Its capabilities as a radio receiver are wide, as five valves are used. An efficient volume control is fitted.

Carron Company.

On this stand a number of utensils for restaurant and hotel work were shown, including a double-oven electric range with boiling top, an electric soup boiler, a water boiler, and a grill and toaster. This apparatus is constructed to withstand the hard wear to which it is subjected. The company also exhibited two examples of its domestic electric cookers, which embody the latest improvements and have porcelain enamelled hobs with the latest design of boiling plate. These cookers also have large grills fitted with three-heat control so that the grilling chamber can be used as a warming chamber when desired. The cookers are highly finished, porcelain enamelled inside and out, and have white enamelled door panels, thermometers, backplate, and hinged rack above. The company also had a selection of electric fires in various finishes, such as electro-bronze, armour-bright, porcelain enamel, and black.

Bulpitt & Sons, Ltd.

Domestic electrical appliances of various kinds were shown upon this stand—percolators, kettles, steamers, &c., all fitted with immersion-type elements. Surgical instrument sterilisers such as that illustrated in fig. 25 were on view. The one depicted is fitted with two 1,000-W immersion elements of an easily-renewed pattern, each fitted with a safety device and earthing arrangements. Two trays of 1¼ in. mesh wire are

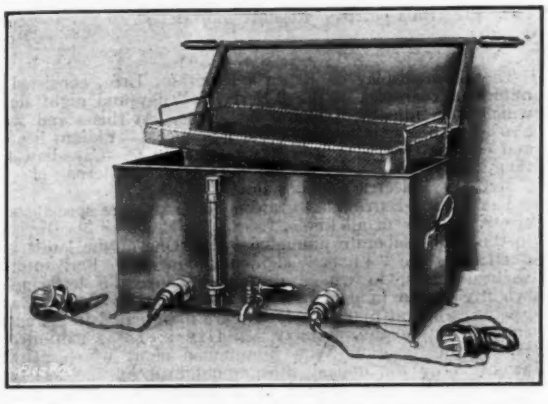


Fig. 25.—An Electric Steriliser.

provided, and there are a draw-off tap and water-level indicator. The whole appliance is heavily nickel plated. Another exhibit was a storage tank (made by George Kent, Ltd.), fitted with a 1,000-W immersion heater. A controlling thermostat is fitted. "B.K.B." fractional h.p. motors, "Giljay" battery chargers, small rotary transformers, and other machines were also shown.

Imperial Engineering Co.

This Wolverhampton firm had a display of domestic electrical appliances of all kinds. This included a new breakfast cooker with a loading of 1,500 W, a square boiling plate with a 1,000-W element, a new electric iron with a pressed steel top, and a range of electrically-heated glue-pots.

C. H. Parsons, Ltd.

This company's products are a familiar feature of the Fair, and this year, as usual, the display of switches, lampholders, plugs, &c., was an attractive one. A new departure of the company is a range of bakelite switch plates in all colours; there was also a new shockproof switch-plug with a body of insulating material and a protective shutter over the sockets.

Drayton Regulator and Instrument Co., Ltd.

This company exhibited a complete range of temperature, pressure, and humidity regulators, temperature and pressure recorders, steam traps, and other specialities. Of particular interest were pressure and temperature-operated switches. The "Drayton" thermostatically-operated switch (fig. 26) is made in two types, type "A" employing a mercury relay for control within narrow limits, and type "B" employing a "Q.B.6" switch for use where the temperature variation allowable is wider. Both types cut in and cut out with precision at the operating temperatures, the only difference being that in type "A" the difference in temperature between cutting in and cutting out is adjustable between 2 deg. to 5 deg., while type "B" is set to a non-adjustable difference of 10 deg. In both types the temperature impulse is obtained through the pressure of a volatile liquid contained in the bulb connecting through the capillary tubing on to a seamless metal bellows against the action of a spring, the adjustment of which determines the temperature at which the switch will operate. Switches are provided with a maximum range of adjustment of 40 deg. F. Above certain capacities the switch should only be used to operate the relay circuit of a clapper switch. The automatic pressure-operated switch (fig. 27) is made in two types, similarly to the other. In type "A" there is an adjustable difference in pressure between 1 lb. and 4 lb.; and type "B" is set to a non-adjustable difference of from 8 to 10 lb. The pressure impulse is received from a seamless corrugated bellows acting against the spring, the adjustment of which determines the pressure at which the switch operates. This movement is multiplied by means of a lever and conveyed through a link to the switch mechanism. The mercury switch type has an adjustable spring-over centre mechanism

Fig. 26.—Thermostatically Operated Switch.

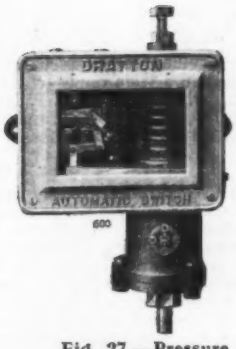


Fig. 27.—Pressure Operated Switch.

which determines the pressure interval between making and breaking of the switch as well as ensuring definite action. The "Q.B.6" mechanism has also spring-over centre mechanism, but, in addition, a catch is provided to hold the contacts closed until the spring-over centre mechanism is sufficiently tensioned, when the catch is released and the switch breaks sharply.

Spauldings, Ltd.

This company exhibited at both sections of the Fair, showing fibre, bakelite, and leatheroid parts which it actually manufactures. The advantages claimed for these materials are that they have the highest insulating properties, and, at the same time, great mechanical strength. They are used extensively in the electrical trades; the bakelite is used specially for telephone work and the better-class electrical work, as it is a good insulator and, at the same time, has a good appearance. Fibre is also used extensively in the motor trade for packing, joints, &c.

Super Suctor Sales, Ltd.

A multi-purpose machine tool was exhibited by this company. This not only functions as a hack-saw which will cut at any angle, but is also a slotter, miller, broaching, filing, and shaping machine. The saw-arm carriage is supported in transverse "V" bearings in the bed, and has a screw adjustment of 4 in., controlled by a handwheel, which enables the saw to operate laterally in any position from zero to 4 in. The work-holding device consists of a table with four faces to which the work is clamped; each face is designed for a particular purpose or purposes. The machine can conveniently be driven by an electric motor.

Benjamin Electric, Ltd.

This company had a display of many types of commercial and industrial lighting fittings. The principal item shown was the one-piece "R-L-M" reflector. This seamless and jointless fitting is dustproof and has an excellent reflecting surface. "Bencolite," elliptical angle, and shop-window reflectors were also displayed. In addition, there was a shockproof handlamp, electric horns, the "Majestic" battery eliminator, valve holders and other radio products. The h.t. eliminator is designed for operation from a.c. mains; it has two variable voltage controls for the detector and intermediate valves and a fixed voltage for the power valve.

May & Padmore, Ltd.

Upon this stand were many examples of the "Maymore" soldering iron and of the company's domestic appliances, including kettles, toasters, bed warmers, &c. A special item was a spun aluminium kettle, without soldered joints, which can be boiled dry without injury. Many of the fires shown were of the brazier type fitted with "Globar" elements.

London Section.

Ferranti, Ltd.

Among this company's exhibits was a trickle charger, operating from a.c. electric lighting mains. Ferranti transformers were shown in a wide variety of designs, including the A.F.-3 specially designed to give uniform amplification throughout the complete range of the musical scale. Other exhibits were 200- and 400-V fixed condensers, chokes for use in the smoothing circuits of battery eliminators, and the Ferranti horn-type loudspeaker.

Mersey Cable Works, Ltd.

This company showed samples of all the different types of rubber-insulated wires and cables that it manufactures. These included the ordinary taped and braided, lead-covered, wire-armoured, steel-tape-armoured, cab-tire-sheathed, oil-resisting and fire-resisting cables. Samples of special "Symoid" oil-resisting cable were also exhibited. A similar display was arranged at Birmingham.

Radio Batteries.

The HART ACCUMULATOR CO., LTD., displayed a full range of its h.t. and l.t. radio accumulators, a new introduction being the "Sturdo" 10-V unit with a capacity of 3,000 milliamps. Primary and secondary batteries for radio use were again displayed in a wide range by the EVER READY CO. (GT. BRITAIN), LTD., while the WET H.T. BATTERY CO. exhibited a full selection of sac Leclanché primary batteries arranged in groups for both h.t. and l.t. purposes.

Other Radio Exhibits.

B.S.A. RADIO, LTD., showed a full range of its wireless receivers. The WATMEL WIRELESS CO., LTD., showed its latest production, the "Orthotone" cabinet set with four valves, the last two being in parallel, and a special loudspeaker. The set is designed to operate from the mains. WRIGHT AND WEAIRE, LTD., displayed a wide range of radio components; they informed us that they are shortly bringing out a three-valve receiving set designed to receive on short waves as well as on the standard 300-500 metre range.

A new radio receiver displayed by HART COLLINS, LTD., was the "Empire Short-Wave 3," an all-enclosed set designed to receive programmes from short-wave stations down to 12 metres, as well as, by means of coils, the usual 300-500 metre stations. EDISON BELL, LTD., combined its radio exhibit with that of gramophones. One of the most attractive sets shown was an entirely-enclosed four-valve set, with a cupboard at each end for the batteries. The DONOTONE LOUDSPEAKER CO., LTD., had a novelty in a combined gramophone and radio receiving set.

AXUEL TIME SWITCHES, LTD., has brought out a new form of time switch clock which can be set to automatically switch on and off wireless receiving sets at any pre-determined time. The new model, "Mark II," which is being adopted in hospitals, is designed to switch over automatically from 2LO to 5GB. The TELEGRAPH CONDENSER CO., LTD., exhibited a full range of its "Mansbridge" and mica condensers for radio use, as well as battery eliminators for both d.c. and a.c. mains.

S. G. Brown, Ltd.

This well-known firm had two stands, one of which was devoted to the Brown electro-megaphones and gyro-compasses

Fig. 28.—Electro-megaphone with Swivelling Trumpet.

and the other to radio loudspeakers and equipment. The electro-megaphones are meeting with increasing adoption in the engine rooms of ships, power stations, printing offices, hotel kitchens, &c., for the transmission of telephone messages from a central control point and the delivery of the messages by megaphone, so that no time is wasted. The Brown system embodies the use of a differential high-power microphone and a reed-type receiver. The instruments are made in a variety of forms, and are usually operated off a 12-volt battery, although arrangements have been made whereby by means of series resistances they can be worked off 110- or 220-volt d.c. supply mains. Two of the latest patterns comprise a combined transmitter and megaphone receiver (fig. 28) and a combined transmitter and double earphone receiver.

In the radio section of the display examples of the firm's many patterns of horn and cone loudspeakers and other accessories were on view, prominence being given to the Brown electrical pick-up for use in connection with gramophones, and an adaptor plug which enables the pick-up to be used in connection with any valve radio-receiving set.

Electrical Measuring Instruments.

Among a range of thermostats, pyrometers, and other instruments, the ACCURATE RECORDING INSTRUMENT CO., LTD., introduced a new automobile sparking plug known as the "Reid View," which is claimed to be free from oiling-up trouble. Another feature is that it is possible to see the spark across the points. Further, by removing a cap, the plug can be used as a primer in cold weather when engine starting is difficult. The FOSTER INSTRUMENT CO. included in its exhibit of pyrometers and other heat-recording and testing instruments, examples of its volt- and ampere-meters, which embody the firm's patent "Resilia" movement.

Advertising Signs.

The main display of BERRY'S ELECTRIC, LTD., consisted of numerous examples of the "Berrylite" day and night signs, which were illustrated in our last issue. At this stand were also to be seen specimens of the "Magicoal" radiant heaters and electric fires. On a separate stand in the Canadian section Messrs. Berry displayed several patterns of the "McClary" electric cooking stoves.

The FRANCO-BRITISH ELECTRICAL CO., LTD., are specialists in electrical signs of all kinds, from a single-letter electric sign to the most elaborate animated type. One of the latest productions is the "Luxor" sign, made in either horizontal or vertical forms, in which, during the day, the lettering is brightly shown in gold or other colour on an opaque background, while at night the letters are illuminated in attractive colourings. Messrs. SYDNEY M. HYMAN, LTD., exhibited a novelty in the Rota-Neon illuminated sign, which attracts attention by the optical illusion obtained by the use of a neon lighting tube rotated by a miniature electric motor. Other exhibitors of daylight and electric signs included the "ATTRACTA" ELECTRICAL CO., SEEFAB, LTD., and STEVENSON'S ADVERTISING AGENCY, the latter concern's display embracing an ingenious electric projector for displaying running lettering at any angle.

Lighting Equipment.

The stand of RESTLIGHT, LTD., took the form of a sun-ray treatment house, all the glazing being in "Vitaglass," which transmits only the vital ultra-violet rays of sunlight between 3,200 and 2,900 Angström units. The company also exhibited specimens of Restlight ceiling pendants, desk standards, and floodlights for use in conjunction with electric lighting, it being claimed for the special glass used that it practically eliminates the excess of orange-red rays of electric light. The THOMAS J. DIGBY ILLUMINATING ENGINEERING CO. was present with some well-designed lighting fittings, included among which was a photographic studio light, taking only 680 watts for a light of great actinic value and a high degree of softness and diffusion, and a 200-watt flood lantern for shop window lighting.

Medical-Electrical Apparatus.

Medical-electrical apparatus was displayed by the AMALGAMATED PHOTOGRAPHIC MANUFACTURERS, LTD., and Messrs. I. CALVETE, LTD., the latter firm showing vibratory massage machines and ultra-violet radiation lamps for both home and professional use. One of this firm's latest productions is the "Ideal" high-frequency unit made up in attaché case form. Although not so costly as the "De-Luxe" model, it conforms to the requirements of electricity supply undertakings, the electrical parts being so arranged that none of them come in contact with the wood of the case.

Miscellaneous Exhibits.

In a wide range of chemical exhibits the GENERAL CHEMICAL AND PHARMACEUTICAL CO., LTD., included samples of its "Casis" accumulator acid for which a high degree of purity is claimed. Ebonite, vulcanite, and various insulating materials made from synthetic resins were exhibited by BAKELITE, LTD., BIRKBY'S, LTD., BRITISH EBONITE CO., LTD., INDURITE, LTD., and SPAULDING'S, LTD. The latest application of electricity is that of a bed-warming blanket shown by THERMEGA, LTD., and intended to supersede hot-water bottles. The material of the blanket is doubled, and between the folds is inserted a flexible conductor located in parallel lines from 2¼ to 3 in. apart. The conductor, which raises the temperature within the bed to about 100 deg. F., takes its current from any ordinary lighting circuit by means of a push-in contact; the consumption is stated to be only about a quarter of a unit per hour.

The Ideal Home Exhibition.

A Review of the Electrical Features.

THE twelfth annual Ideal Home Exhibition, held at Olympia, London, under the auspices of the *Daily Mail*, which was opened by the Lord Mayor on February 28th, and which will continue open until March 24th, fully maintains the highly attractive character it has always achieved. Indeed, this year it would appear to have beaten previous records, certain changes having been made in what may be termed the internal lay-out of the building, which render it difficult to realise that one is still under the roof of the long-familiar Olympia, among the more important innovations being the erection of a special "Bridge of Beauty" from gallery to gallery across the main hall. It may here be mentioned that for the lighting of the latter, Messrs. William McGeoch & Co., Ltd., have again supplied a large number of special electric light fittings hanging from the roof, somewhat similar to those used at last year's Exhibition, which were illustrated in these columns at the time, and have also supplied the stands and lanterns on the staircases, &c.

Needless to say, electricity and its various applications play no small part in creating the attractive character of the display; one might even go so far as to assert that it is electricity, and electricity only, that renders such a brilliant display possible. At every stand it is utilised for illuminating purposes, whilst a stroll round the Exhibition reveals an ever-extending variety of electric light fittings and examples of the thousand and one directions in which electric power is to-day being utilised for labour-saving and convenience-providing purposes. Electric fires, cooking stoves, water heaters, refrigerators, washing and ironing machines, and carpet sweepers, are only a few of the many applications which, it is satisfactory to learn from exhibitors, are daily becoming more and more widely used by all sections of the public.

Perhaps the "clou" of the Exhibition, at least from the point of view of novelty, is "The House of the Future," which is situated in the New Hall. The catalogue describes it as "amazing," and although one may doubt whether the house of the future and its equipment, or even its occupants, will be akin to those displayed, there can be no question of its importance from the attraction point of view, which, after all, is perhaps the important aspect of these Exhibitions. At the same time, it brings home to the general public in striking fashion how modern progress in electricity and electrical appliances and other scientific developments can be pressed into the service of everyday life. Some further notes on "The House of the Future" will appear in a later issue. Following our usual plan, we propose to refer briefly in this and succeeding issues to some of the more important exhibits of interest from the electrical point of view.

The British Broadcasting Corporation.

In one of the rooms leading off from the gallery of the main hall the B.B.C. has arranged an interesting and instructive Listeners' Hall in which an effort has been made to visually demonstrate the work entailed in drawing up a week's broadcasting programme, this being arranged in a series of six "peep-shows." A model is also shown of a modern broadcasting studio indicating the relative positions of the microphone and piano, the silence cabinet for the announcer, the warning light signals and the drapery used over the walls to prevent undue echo. Adjacent thereto is a model of the London emission control room, this comprising four control tables containing the amplifiers used in connection with the studio microphones, the line amplifiers, the relay and fuse panels, and other equipment. Models dealing with many other aspects of broadcasting are also on view, the whole exhibit, while being a popular rather than a technical display, being one on which the B.B.C. is to be congratulated.

The Telephone Development Association.

In order to encourage the use of the telephone by the public, the Telephone Development Association again has a stand, attention to which is directed by means of a giant model of a telephone receiver and transmitter, while at the rear is a large map with the names of the different cities and towns on the Continent with which telephonic communication is now available. Specimens of the latest forms of automatic instruments are on view, advantage being taken of the Exhibition to educate the public in the method of calling up any desired number and on any exchange by means of the movable dial fixed to the instrument, and to emphasise the important point that the successful working of the automatic system depends on first removing the receiver from its supporting arm. For the benefit of technically-interested visitors, one of the instruments is shown in section.

Petters, Ltd.

Messrs. Petters have for some years specialised on the production of compact house-lighting plants, and on this occasion confine their exhibit to examples of their 1½-kW belt-driven and 1-kW direct-coupled sets. The single-cylinder, water-cooled engines in both cases are of the two-stroke type adapted for use with either paraffin or petrol. The engine of the 1½-kW set runs normally at 700 r.p.m., and the dynamo generates at 50 volts. Used in conjunction with the set is a 27-cell 100-Ah battery.

The other set on view is of the direct-driven type, designed to run at 1,000 r.p.m. The dynamo generates at 50 volts and is supplied with a 50-amp.-hour battery. In both cases automatic starting and a switchboard surmounting the dynamo are provided. The sets exhibited are typical of a wide range of smaller and larger house-lighting plants supplied by Messrs. Petters.

Thorne & Hoddle, Ltd.

In addition to examples of their acetylene plants, the firm display two specimens of the country house electric lighting sets on which they are specialising. One of these is a "Pelapone" unit comprising a 3½-b.h.p., single-cylinder, four-stroke engine, direct-coupled to a 1½-kW dynamo similar to one they have recently installed at Twitts Ghyll, Five Ashes, the old Tudor residence in Sussex of Sir Austen Chamberlain, M.P. The installation, which is designed to supply 60 lamps, with a total of 18 in use at any one time, includes a 50-volt battery of 140 Ah capacity. Also shown is a "Pelapone" lighting set intended for larger installations, this comprising an 18-h.p., four-cylinder engine and direct-driven 10-kW generator neatly arranged on the same bedplate. On this stand is also to be seen an example of the "Good-Egg" electrically-

Fig. 1.—The "Good-Egg" Electric Pump.

operated water pumping set, also intended for country house use, and made by Messrs. F. W. Brackett & Co., Ltd., Colchester. Designed to be operated by current from the house supply, the set comprises a 0.4 h.p. motor, a small but effective direct-driven centrifugal pump, and special interceptor, which renders any subsequent priming unnecessary. The combination has a capacity of raising 150 gallons of water per hour from a suction depth of 22 ft. to a total height of 50 ft. By means of a simple float switch attachment the pumping set is rendered entirely automatic, that is to say, when the level in the storage tank falls below a certain level, the current is switched on and the pump set into motion. Conversely, when the storage tank is again replenished, the current is automatically switched off so that no power is wasted and a supply of water is constantly available. Messrs. Brackett also make a range of "Aquarius" electrically-operated plunger pumps, a feature of which is the use of a special, easily-removable valve unit. These sets are made in capacities from 150 to 1,500 gals. per hour, and for heads of from 50 to 300 ft.

Messrs. Thorne & Hoddle's other exhibits include samples of the Creda portable and fixed electric fires, kettles, irons, &c., and also specimens of surface wiring.

Hammond Bros. & Champness, Ltd.

Among the several small lifts for use between the kitchens and dining rooms of houses, clubs, and hotels, shown by this firm, is an electrically-operated one designed for working between two floors. In its out-of-use position, the lift and its operating mechanisms remain in the kitchen, a hinged flap in the floor of the dining room rising and falling as the lift itself rises and descends. There is consequently no unsightly or space-occupying erection in the dining room which the lift serves. It is operated by a ¼-h.p. electric motor and it is claimed that the energy consumption is only about one unit per 500 trips of an average of 12 ft. The firm also displays an electric lift designed to serve three floors and operated by means of push-button switches. The lift, which is intended for loads up to 1 cwt., is automatic in its action and is so designed that it cannot be started when any of the protecting shutters are open; while *vice versa*, should any of the shutters be opened while the lift is in motion, it is automatically brought to a stop, so materially reducing the risk of accident.

(To be continued.)

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Leading P.F. Motor.

The "Kosfi-leading" induction motor is a recent introduction of the English Electric Co., Ltd., Queen's House, Kingsway, W.C.2. It is claimed that it will supply some leading wattless current to counteract part or all of the magnetising current drawn from the line by ordinary induction motors. By a simple adjustment of the brush rocker the motor will operate at unity power factor, or slightly leading, between no-load and 50 per cent. overload. The machine is of the compensated slip-ring type, and its ratio of starting

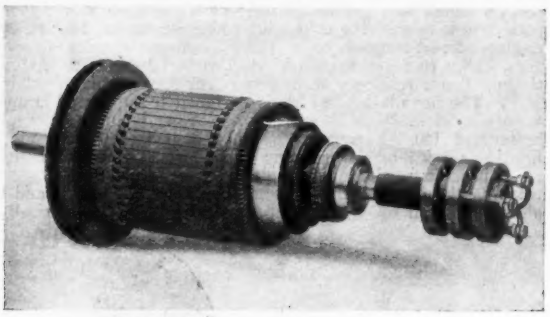


Fig. 1.—Rotor of Leading P.F. Motor.

torque to starting kVA is claimed to be equal to, or better than, that of the ordinary induction motor. The new motor has also the same slightly drooping speed characteristic as the ordinary induction machine. The commutator and brush gear occupy very little space, and by reason of the very low voltage generated in the auxiliary winding, no difficulties, it is claimed, are met with in commutation. The control gear required is about the same as that necessary for the normal slip-ring induction motor. Fig. 1 shows the machine rotor.

A H.P. D.C. Localising Bridge.

An interesting development of Messrs. British Insulated Cables, Ltd., Prescot, Lancashire, is the high-pressure d.c. localising bridge illustrated in fig. 2. It is intended for use in conjunction with a "Kenotron" d.c. generating set, or other source of h.p. d.c., for the localisation of high-resistance faults in the neighbourhood of from 0.5 to 1 megohm. The bridge consists of a B.I. standard rotating drum localiser mounted on porcelain insulators. The drum shaft is connected through a universal coupling to a 3-ft. insulating rod, the

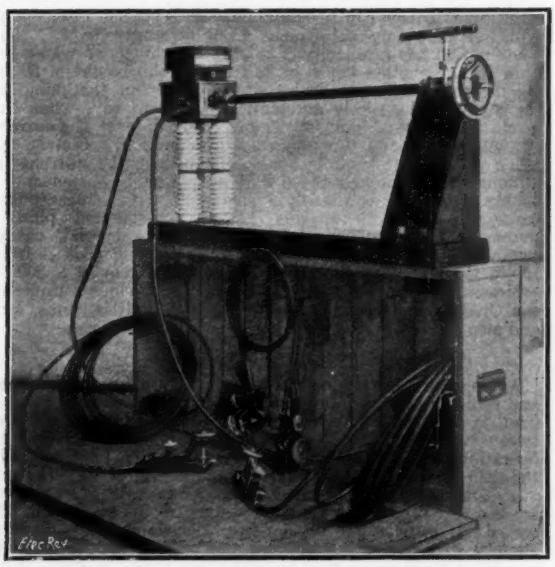


Fig. 2.—High-resistance Fault Localising Set.

other end of which is terminated by a brass shaft to which the operating handle is attached. The shaft runs on bearings mounted on the same base as the localiser and its insulators. A Unipivot galvanometer is placed on top of the localiser so that the scale faces the operating handle. It is fitted with a switch and variable shunt, which can be operated while under pressure by means of a suitable insulating rod. Near the operating handle and attached to the main framework is a reading telescope. Suitable earthing arrangements are provided for the framework. The bridge works on the "Murray" loop principle, and the ratio X/2L as a percentage is given directly on the localiser scale. Suitable connecting leads are provided of about 0.1 sq. in. section and about 40 ft. in length.

A Unit-Type Feeder Pillar.

A unit-type feeder and distribution pillar, fig. 3, which has recently been introduced by Messrs. Sykes & Dyson, Ltd., Queen's Mill Road, Huddersfield, contains some interesting design features. The pillar body is a cast-iron frame-work with steel panels in the sides and doors. Loose aprons are provided at the back and front to facilitate the jointing of the cables. The sealing chamber is of cast-iron, and is made in three parts. A two-way entrance is provided for the cable, and either way can be used by changing over the blank cap or gland. The lower portion of the cover may be replaced first, so that the bottom of the chamber may be filled up with compound before replacing the top part. The front of

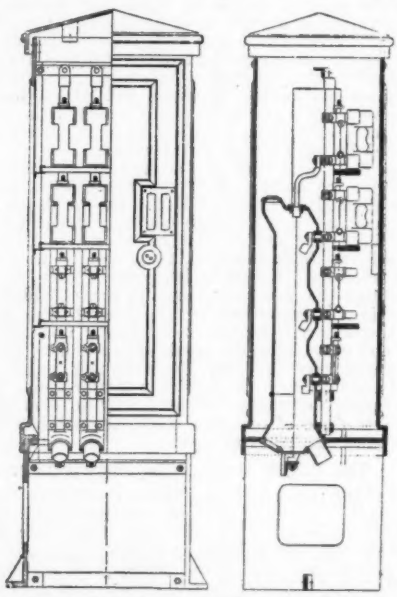


Fig. 3.—Construction of Feeder Pillar.

the sealing chamber carries a steel tube, insulated with a special covering, upon which are mounted the grip fittings. The portion which carries the copper contacts is guarded with an insulated shrouding, and by unfastening the 5/16-in. hexagon head screw the whole contact and fitting may be quickly replaced. The handle is of a high-grade insulating material, and is fitted with the patent "Saco" self-aligning blade. If required, the makers' standard grip fittings may be arranged for the disconnecting links. It is claimed that the distribution unit can be replaced without disconnecting any of the other units in the pillar.

An Electric Vote Counter.

An electric contrivance which has been invented in Sweden for the purpose of counting the votes at Parliamentary sessions has been delivered to the Finnish Riksdag by the L.M. Ericsson Company in Stockholm, and is now in operation. This machine registers and counts the votes in secret voting in record time. In the Finnish Parliament during 1925, 300 secret votes were taken, requiring an aggregate time of 75 hours. With the new machine, it is claimed, the time could be reduced to 10 hours. Further claims for the new apparatus are that it eliminates every possibility of mistake and exercises perfect control of the voting procedure.

An Improved Electric Iron.

Our attention has been drawn to various improvements which have recently been effected to the "Elect" electric iron made by the Electric Heating Co., George Street, Croydon. Permanent connections are now employed direct from the element to the terminals, so as to dispense with any suggestion of intermittent or faulty connection at that point. A thumb rest is also employed and the terminals are totally enclosed.

Domestic Applications of Electricity.

Some observations on the general use of electricity in the home, and comparative notes on the consuming devices.

By A. J. MILNE and R. H. RAWLL.

(*Abstract of a paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

WITH the efforts being made at present to encourage the more extensive use of electricity for heating, cooking and other domestic purposes, there is a great tendency to overlook the important part that lighting plays in the home. It should not be forgotten that the average supply undertaking obtains practically half of its revenue from the sale of energy for lighting purposes.

Home-owners appear to be unaware of the many excellent lighting appliances which are on the market to-day, at quite reasonable prices, and one often sees in houses old gas fittings now doing duty with electric light.

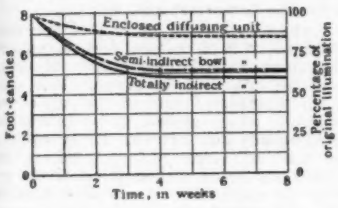


Fig. 1.—Depreciation of Lighting Systems due to Dust.

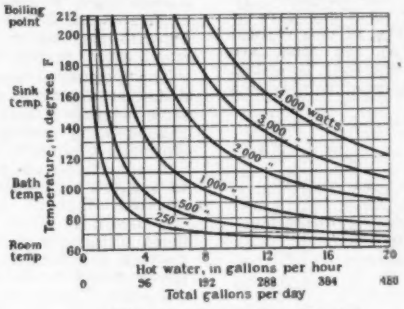


Fig. 2.—Immersion Heater Performance Curves.

An important point that is often overlooked is the necessity for regularly cleaning fittings, reflectors and lamps. The curves shown in fig. 1 indicate the effect of dust on different types of fittings, and also illustrate the advantage in this matter of a totally enclosed glass fitting over one of the ordinary open-bowl type.

In order to prolong the life of lamps, some people underrun them, *i.e.*, run them at less than their rated voltage. That is a mistaken policy; a 10 per cent. reduction in voltage causes a 33 per cent. decrease in the candle-power of the lamp. This means that for the same output of light, a lamp would be required of a higher power, and at greater cost, than would be necessary if run at its rated voltage.

With electricity at 1d. per unit, an electric fire compares favourably in cost with the open coal fire, particularly so when the period of artificial heating does not exceed 3 or 4 hours. Allowance is very rarely made in the case of electric heating for the convenience in operation, the absence of igniting materials, and the handling of fuel and ashes, with their consequent dust and dirt. In order to make a fair comparison between the two methods, such items represented in terms of money should be put to the credit of the electrical method. If such an allowance is made in those cases where the cost of energy for electrical heating exceeds the fuel costs of the coal fire, in numerous instances the former method will be shown to compete favourably with the latter.

Where radiant heat is employed, much lower air temperatures are entirely comfortable. A person will feel warm and invigorated in a room in which the temperature is below 50 deg. F., while with air-warming methods an air temperature of 60 to 65 deg. F. is necessary.

A test was taken to obtain the actual difference in the heating effects of the plain and reflector types of fires, and the curves A and B in fig. 3 clearly show the difference in the thermometer readings taken, the two fires having their loading (3 kW) carefully equalised. Curve A shows the readings taken with the reflector fire, and curve B those with the plain fire. Each fire was in turn placed in position and thermometer readings were taken at various points in front of each on a semicircle of 3 ft. radius from the fire. The tests were made in a closed room, the air temperature of which was taken in a position shielded from the direct rays of the fires and simultaneously with the front readings. The difference between the air temperature and the temperature readings taken in front of the fires indicates the difference of the radiant effect. For convenience, temperature differences in degrees Centigrade have been scaled radially at the different angles at which the temperature differences have been noted. Those on the right-hand side of the graph represent differences in temperature measured at a height of 3 ft. from the ground, and those on the left-hand side represent temperature differences at a height of 2 ft. from the ground. It is interesting to note that at a height of 3 ft. the reflector type shows up very favourably, particularly with the readings taken more directly in front, and that at a height of 2 ft. the plain type of fire gives better results.

The present high charges made for electrical energy supplied for water-heating purposes provide the principal obstacle in the way of development of this class of load. Since hot water is an absolute necessity in the home, the hot-water load is capable of producing as much revenue as the cooking and lighting loads together. In addition to the maximum demand of an electrically heated storage tank being considerably lower than that of a cooker, its load factor is very much higher, and yet in numerous instances the charge per unit is the same for cooking and water heating. There appears to be no reason why a fixed charge per quarter, varying with the loading and capacity of the apparatus, should not be made. This could include the hire of storage apparatus, its maintenance and the current supplied. The details of such a scheme would, of course, have to be carefully worked out, but the authors feel confident that this suggestion merits serious consideration.

Local- and central-storage systems are growing in popularity, the particular one adopted depending upon the duty allotted and the number and positions of the taps where hot water is required. Where the draw-off taps are within a radius of 20 to 30 ft., the better plan is to provide a central-storage tank of ample size, well lagged, with 3-heat control, or, preferably, automatic temperature control. In those cases where the taps are in isolated positions or at long distances apart a local-storage heater is the better proposition. One advantage of the central-storage system is that it permits the full capacity of the tank to be obtained at any of the draw-off taps. It is the opinion of some experts that, once the price of current for water heating comes down universally to ½d. per unit or less, the central-storage system will become the standard and the other systems will tend to disappear. The authors are indebted to Mr. Nobbs for the chart shown in fig. 2, which is very useful for determining the sizes of immersion heaters required for various hot-water supplies. It is based on an average efficiency of 88 per cent. The curves shown in fig. 4

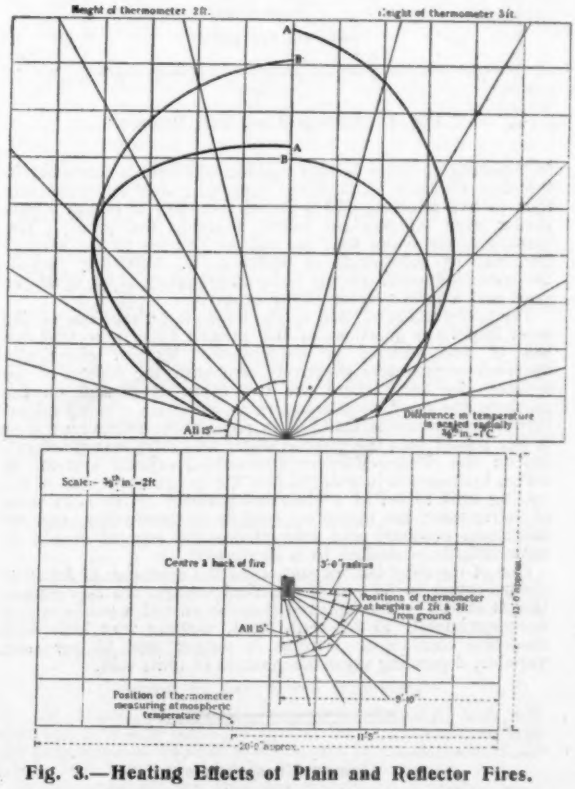


Fig. 3.—Heating Effects of Plain and Reflector Fires.

illustrate a test carried out on a small storage heater fitted with thermostatic control, and indicate that the consumption is well within reasonable limits where the tariff is in the region of 1d. per unit.

The commercial success of electric cooking is now an established fact, and the consumption rate of 1 unit per person per day can no longer be regarded as other than a fair average figure. The cooking load has a diversity factor of 9 to 10, and is, for all practical purposes, an off-peak load. It is agreed that the load is such that, as far as the generating station is concerned, 0.1d. per unit is considered adequate to cover mains increases, and also that the cooker consumption is from seven to eight times the normal lighting consumption. The working-class consumer is, above all, the one to be considered. The overall thermal efficiency of a modern electric cooker in general use, of the type usually hired out, is about 54 per cent., that of the oven itself being about 90 per cent., and the combined efficiency of the boiling-plate and cooking utensil 45 per cent. Attempts have been made to overcome these losses, and there are available at the present time cookers embodying the principles of radiant and induction heating, which, it is claimed, deal effectively with the situation. In the radiant-heat system of cooking the ordinary grill is dispensed with; the oven elements, consisting of two vertical units which radiate heat directly on to the food, are brought together for this purpose, and the food is grilled on both sides at once. The great advantage of this system

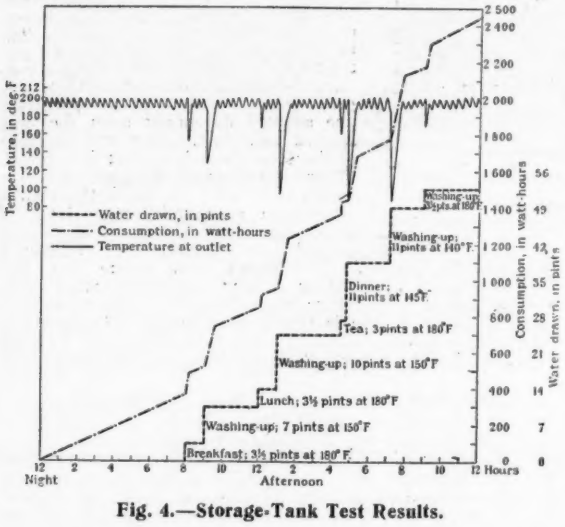


Fig. 4.—Storage-Tank Test Results.

for roasting purposes is that cooking commences immediately the elements have attained red heat, *i.e.*, after approximately four to five minutes, and it is not necessary to obtain a particular oven temperature before inserting the joint. The manufacturers claim that the risk of damage to the vertical elements by spluttering or spitting is extremely small. Domestic induction cookers have an efficiency of 85 to 92 per cent. and a power factor of 0.9 or over.

The preservation of food in the house is perhaps one of the most important questions of the present time, now that the use of preservatives is condemned. Modern electrically operated refrigerators effectively deal with the defects of the ordinary ice box. There are two types at present on the market: the mechanical refrigerator, in which a small motor-driven compressor is installed to reclaim the refrigerant after it has passed into the gaseous state; and refrigerators operating on the Platen-Munters ammonia-absorption system, in which hydrogen is introduced into the low-pressure side of the cooling unit to act as a pressure-equaliser. With both types of refrigerator the operating cost is extremely low, and for maximum economy and convenience the current should be automatically controlled by a thermostat.

One of the chief factors controlling the extension of domestic electrification is the cost of electrical energy. In this connection it should be remembered that the cost of a public supply is approximately 75 per cent. fixed, varying very little with moderate increase or decrease in output, and 25 per cent. variable, depending upon the number of units sold.

German Unemployment.

The Berlin correspondent of *The Times* says that the German unemployment returns, which rose steadily during the later months of 1927 and reached a total of 1,599,000 in the middle of January, showed a slight decrease for the first half of February from 1,548,000 to 1,506,000. This total included 1,291,000 persons in receipt of ordinary insurance relief (a decrease of 42,000), while the number in receipt of extended benefits remained stationary at about 215,000.

The Marking of Imported Cables.

Order-in-Council Recommended.

THE Standing Committee of the Board of Trade under the Merchandise Marks Act, 1926, has published its report regarding the marking of imported insulated electric wires and cables (Stationery Office, 3d. net).

This report reviews the evidence which was given at the inquiry on December 12th last and subsequent days. A report of the proceedings was given in our issues of December 23rd and 30th. The applicants for a marking order were the Cable Makers' Association, supported by the Independent Cable Makers' Association and the Metropolitan Electric Cable and Construction Co., Ltd.; the opponents were the Electrical Importers' and Traders' Association. Generally speaking, the applicants asked that marking should be by means of internal tapes in the case of large cables and by tabs in the case of small wires, as well as on the drums, spools, &c.

The Committee says that on a careful review of the evidence, arguments and exhibits, it is of opinion that as regards some categories there is an appreciable possibility of purchasers being unaware of the origin of the goods. This conclusion is confirmed by the wording of some of the catalogues and advertisements produced, which appear to be calculated to suggest that imported goods are British. It is equally apparent that in the case of large underground cables the possibility of the purchaser being misled is relatively remote, unless the claim of the applicants be admitted that in the case of a municipal supply undertaking the individual ratepayer should be deemed to be the ultimate purchaser. The Committee comes to the conclusion that it is desirable that an indication of origin should be required in the case of all the categories of goods included in the application. But it is of opinion that the marking should be as simple as possible, and impose the minimum of trouble and expense. It is unable to recommend some of the methods of marking proposed by the applicants. It sees no ground for requiring any internal mark in the case of underground cables; all that is necessary is an indelible mark of origin on the drum. The impression of a mark on the lead seals on the ends of the cable is not recommended.

As regards small cross-section wires and cables, the Committee is unable to accept the suggestion that goods of these categories which are at present imported without a tape should be required in future to have a tape inserted or, alternatively, that a mark of origin should be printed on the core or stamped or embossed on the external rubber sheath. Any such requirement would, in its opinion, be unnecessarily onerous. It is thought that the case will be met by an indelible mark on the drum, reel, bobbin or spool, or on a label attached to the coil.

As regards cotton- and silk-covered or enamelled wires, the Committee thinks that the bobbins, reels or spools on which they are wound should bear an indelible indication of origin. Also where any of the goods are imported or sold or exposed for sale in coverings, cartons or other containers, the container should also bear an indication of origin. To meet the case of sales of smaller quantities of goods, it should be provided that in the case of sales from a coil the label must remain attached to the coil from which it is sold.

The Committee is of opinion that an Order operating at the time of sale or exposure for sale only might prove ineffective owing to the great difficulty of distinguishing between imported and British-made cables and wires in the absence of an identification mark of some kind. It thinks that an exemption ought to be provided for cable and wire if, at the time of importation, they form an integral part of an imported article.

It is therefore recommended that an Order-in-Council should be made in respect of imported cables and wires of all descriptions except where they form an integral part of an imported article. The indication of origin should be applied in the manner set out in an annex to the report. It should be borne at the time of importation and also at the time of sale or exposure for sale in the United Kingdom. It should be expressly provided in the Order that exposure for sale shall include exposure for sale wholesale by a person being a wholesale dealer.

The annex is merely a repetition of the conclusions, but the precise method of marking suggested is also given as follows:—"The indication of origin shall be marked conspicuously in the manner provided below on the drums, reels, bobbins or spools, on which the goods are wound, or on a label attached to the coil:—(a) When imported, sold or exposed for sale on drums, reels, bobbins or spools—indelibly branded or incised or impressed by stamping, on both ends of the drum, reel, bobbin or spool. (b) (i) When imported in coils, or when sold or exposed for sale in coils as imported—indelibly stamped or printed on a label attached to the coil by a band, the ends of which are brought together in a lead seal. (ii) When sold or exposed for sale after being re-coiled in the United Kingdom into smaller coils—indelibly stamped or printed on a label securely attached to the coil."

The Faraday Lecture.

Electricity in the Service of Man.

DR. S. Z. de Ferranti took the above title for the Faraday Lecture which he delivered at the Institution of Electrical Engineers in London on Thursday, March 1st. Mr. Archibald Page (president) was in the chair, and there was a crowded audience.

Starting with the lodestone, Dr. Ferranti gave a rapid review of the history of electricity, laying stress on the invention of the galvanic battery, and of the dynamo, which led to the development of the many uses to which electricity is now put. Whilst electricity had already been widely utilised for industrial purposes, there was, he said, an extensive development possible on the domestic side, and it was that aspect which had received least attention. Yet the amount of work done in the home was enormous, and only electricity could lighten that work. Already to a considerable extent electricity was used for lighting, cooking, and heating, and electric kettles, vacuum cleaners, &c., were largely employed; all this, however, only went part of the way, and until they got their homes completely electrified they would not feel the real advantages of electrical working. To achieve this full electrical working in the home, electricity must be sold at a very cheap price, and it was essential that apparatus should be provided which not only worked efficiently but was obtainable at a sufficiently low price to enable it to be used universally; it must also be capable of being maintained at a low cost.

There were many considerations which governed the questions how far and how quickly general home electrification could take place, but the three main factors were cost of energy, cost of apparatus, and the attitude of the women of the country. Not a great deal had yet been done—with some notable exceptions—to sell electricity. At the moment, people bought electricity very largely because they had to, but a real vigorous pushing of the sale of electricity and bringing home to the public the fact that they required it was quite a different matter, and he could not help feeling that the electrical industry was not doing anything like so well as another great competing industry. If that policy were pursued there would be a much more rapid development. The E.D.A. had done a great deal of valuable work in popularising electricity, but the funds at its disposal had been very limited, and in the circumstances it was surprising that so much had been accomplished.

He looked for a great deal from the Electrical Association for Women, which already had a membership of over 2,000, and the supply undertakings and other interests would do well to assist this movement in every possible manner. One point not to be overlooked was that with the advent of more electrical appliances into the home a greater degree of knowledge of mechanical things was required. That knowledge was being acquired by those concerned with the home in many ways. The extensive use of the motor-car had assisted, and so had wireless, but the Electrical Association for Women could be most helpful in imparting just that knowledge which was necessary to those who had to run the homes of the country. The electrification of the home was a matter which could be developed immediately, and it did not need any great invention to make it possible.

In other directions, there was work to be done before electricity could be fully utilised. This full development depended very largely upon the question of storage. This was impossible at the moment, in the large quantities that were required, with the lead storage battery, but fortunately it was possible to store the product of electricity—heat—in water, which had a wonderful storage capacity for moderate heat, and the principal requirement of the household was low-grade heat. It would never be possible to utilise electrical generating plant for 24 hours per day throughout the year, but the storage of heat in the manner he had suggested would carry us a long way towards that end.

Speaking of the future, Dr. Ferranti said that he looked upon electricity as likely to regenerate the agricultural industry in this country because, with our relatively small acreage, the problem resolved itself into intensive cultivation. Looking still farther ahead, Dr. Ferranti visualised the invention of some means of storing electricity after the manner of the lead battery with its consequent enormous effect in the displacement of all reciprocating machinery as now used on motor-cars, coupled with a reduction in the cost of maintenance to a ridiculous figure compared with what was now necessary. Applied also to the running of trains, such an invention would have far-reaching effects; and, again, as regarded ships and aircraft, what wonderful performances would be possible!

Finally, Dr. Ferranti, referring to the fact that he had already given this lecture to five local Centres and was due to give it to three others, said it seemed to him that the time could not be very long deferred—bearing in mind the recent joint meeting of the Institution and the American Institute by wireless telephony across the Atlantic—when the Institution would be holding meetings in common all over the country. That would be a great feat electrically, and it would be a great saving of time. It was a thing which, he believed, would come about, and he wondered whether this would be the last Faraday Lecture given in which the lecturer went round personally to all the local Centres. Whilst, however, from some points of view that would be a great convenience, on the other hand, he would have missed the great pleasure of meeting the many friends he had met in different parts of the country, and he might not have been able to gather, as he had done, how much this subject of electrical development appealed to everybody with whom he had come into contact. That was of very great importance to the Institution, because it showed the Institution was very much alive, that it was doing good work, and it would certainly do great deal more work in the future.

Mr. FRANK GILL, proposing a vote of thanks to Dr. Ferranti, said that having listened to the extremely interesting lecture, one could only surmise what would have been Faraday's pleasure and astonishment if he could have followed all that had arisen out of his work, in the future development of electricity. He would have stopped the lecturer many times and said: "What is this?" and "What is that?" and he certainly would have been intensely delighted. The lecturer had given them a great deal of matter for thought, but in connection with Dr. Ferranti's statement of the requirements for the development of electricity in the home there was one factor which had been missed: Dr. Ferranti had mentioned the women, but he had not referred to the way the men treated the women. That was the cause of a great deal of work. There must be a great deal of drudgery in going over the same work in the house day after day, and the men certainly had a much better time than the women. There were elements of comfort in the home which the men could bring before the women, but which they did not, simply because they did not think of it.

Dr. ALEXANDER RUSSELL seconded the vote of thanks, and, incidentally, congratulated Dr. Ferranti upon having been elected a Fellow of University College, London, last week. Referring to his work as a young man, Dr. Russell recalled how at 18 years of age Ferranti patented, with Lord Kelvin, a new form of alternator, and added that the seed sown in those early days had grown marvellously and flourished exceedingly. Dr. Ferranti was acknowledged all over the world as the pioneer of high-pressure transmission, and he hoped that ere long the country would suitably acknowledge its indebtedness to him.

The vote of thanks was carried with acclamation.

Legal.

British Thomson-Houston Co., Ltd., v. Johnson, Ross & Co.

MR. JUSTICE RUSSELL, in the Chancery Division on March 2nd, had before him a motion by the British Thomson-Houston Co., Ltd., against Johnson, Ross & Co., Kingsway Corner Buildings, W.C., for an injunction restraining infringement of the plaintiffs' patents for leading-in wires and gasfilled lamps.

Mr. TREVOR WATSON, for the plaintiff company, said the case had been settled, but in view of the very large number of actions depending on this he would like to state the circumstances connected with it. The defence was that the lamps in question were in fact manufactured under the plaintiff company's licence because they bore the words "Ferro-Watt" and "Gas-filled." The plaintiff company had, in fact, licensed certain manufacturers to make these lamps, but those complained of in this case were spurious imitations. The differences in the wrappers and markings were minute, he said, but he had evidence from Vienna which proved infringement up to the hilt. In the circumstances the defendants were prepared to submit to judgment for a perpetual injunction in the terms of a writ, and would pay an agreed sum for costs, and there would be an inquiry as to damages.

Mr. D. N. CORSELLIS, for the defendants, said that his clients were perfectly innocent infringers, but the matter had caused considerable anxiety to the holders of genuine "Ferro-Watt" lamps.

His LORDSHIP gave judgment by consent on the agreed terms, and observed that there was nothing to prevent the selling of genuine "Ferro-Watt" lamps.

General Radio Co., Ltd.

WHEN a petition by H. Clarke & Co. (London), Ltd., for the winding up of this company came before Mr. Justice Eve, on Monday last, it was stated that the debenture holders had appointed a receiver and manager and negotiations were proceeding for the sale of the assets and goodwill at a satisfactory price. The company might then be able to pay the unsecured creditors in full. The petition was accordingly adjourned for a fortnight.

Appeal by Col. Eaton Dismissed.

IN the Court of Criminal Appeal on Monday last, Col. Edmund O. Eaton appealed against his recent conviction for the publishing of fraudulent statements in prospectuses of the Chalk Fuel Power Gas and By-Products Corporation, Ltd.

It was urged for the appellant that in his summing up at the Old Bailey, the Common Serjeant had failed to put before the jury the correct construction of the evidence of an engineer who had tested the fuel which the company produced; also the appellant's defence had been prejudiced by references to other companies with which he was connected.

Mr. Justice AVORY, in dismissing the appeal, said that Eaton was acquainted with the nature of the report of the tests and he could not disclaim that he had anything to do with the publishing of the misleading prospectuses.

Electricity Supply in Glasgow.

Conditional Resignation of the Manager.

THERE was a surprising development in the Glasgow Corporation Electricity Department controversy when the Town Council met, on Thursday, March 1st; Mr. R. B. Mitchell, engineer and general manager of the Department, offered to resign his position on certain conditions. The minute of the meeting of the previous Friday, when on a show of hands the Corporation, by 43 votes to 42, decided to ask for Mr. Mitchell's resignation, was formally adopted. The Town Clerk then reported that he had received the following letter, dated March 1st, from Mr. R. B. Mitchell:—

"I duly received your letter of the 24th ultimo, intimating that at a meeting of the Corporation held on that day it was resolved that I be asked to resign my position as engineer and manager of the Electricity Department.

"The resolution intimated to me and the publicity which has been attached to it casts, as the Corporation must be aware, a very serious reflection on my professional reputation, and in view of my age, must be fatal to my career. In the circumstances, therefore, I have taken a little time in which to consider my position, otherwise I would have acknowledged your letter sooner.

"May I say that in spite of the recent criticism, I had hoped that during my 30 years' service with the Corporation I had won that confidence which it has certainly been my constant desire and endeavour to deserve, and I had looked forward to seeing the department under my charge reaping the benefit of the work which had been done by me for its advancement. No reason is given for asking for my resignation; but there is a suggestion that, in the view of the Electricity Committee and of the Corporation also, expenditure had been incurred by my department without the sanction therefor being obtained, and that other action had been taken without express authority. The Corporation know my position in regard to that, and I do not propose to refer to it further here; but I think I am entitled to say this—and I would wish the Councillors to believe it—that in everything I did do, I acted honestly and in the best interests of the Department and of the community; and in the circumstances—even on the assumption that there is blame attributable to me—the penalty seems to be out of all proportion to any error believed to have been committed.

"After full consideration, however, and in view of the vote of the Town Council, I feel that I have no alternative that I would care to contemplate other than to tender my resignation and to leave myself, as I now do, in the hands of the Corporation—with this reservation, that some position compatible with the services already rendered by me and my experience as an engineer be found for me in the reorganised department, or otherwise that I receive the remuneration allowance to which I am entitled under the superannuation scheme, or have some other provision made for me by the Corporation in view of my lengthened services."

The Town Clerk also reported the receipt of two other letters. The Associated Municipal Electrical Engineers sent the following, dated February 27th, and signed by Mr. A. Nichols Moore, hon. secretary:—

"The Executive Committee of this Association have had brought to their notice the report of the special Sub-Committee on the administration of your Electricity Department, and the subsequent discussion of the Council thereon, and have given consideration thereto in so far as any recommendations of the special Sub-Committee and decisions of the Council affect Mr. R. B. Mitchell, your engineer and manager, and a prominent member of our Association.

"Whilst my Executive Committee have no desire or intention to enter into any discussion on the merits or demerits of the case, they do desire to point out to your Council that in their opinion there is a possibility of a very grave injustice being done to your engineer and manager if your Council's recent decision is to be allowed to stand without Mr. Mitchell being afforded an adequate opportunity of obtaining an impartial inquiry into the entire position. My Executive feel sure that it is not the desire of your Council to take any action which would be a grave injustice to Mr. Mitchell, and to avoid any possibility of this I am directed to ask:—

"That your Council will agree to the holding of a joint inquiry by two impartial experts—one an electrical engineer of eminence, a member of the Institution of Electrical Engineers, and qualified to make an investigation into the administration of a large municipal electricity supply undertaking; and the other a financial expert, a member of the Institute of Chartered Accountants, and similarly qualified.

"That the Electricity Commissioners should be asked to nominate these two gentlemen, or should the Electricity Commissioners for any reason be unable to do so, that they be nominated by the President of the Institution of Electrical Engineers.

"If such an inquiry is agreed to, that the proceedings should be commenced at the earliest date possible."

The other letter, from the divisional organising secretary of the National Association of Local Government Officers, read as follows:—

"My Committee feel that a decision of such grave significance to an official, whose personal character and conduct are not in question, has been reached under circumstances which have deprived him of an adequate opportunity to safeguard at least his professional reputation, on which his future depends, by means of a searching and appropriate investigation. The Corporation no doubt appreciate the fact that the harsh and inconsiderate manner of terminating compulsorily Mr. Mitchell's services, which have extended over a period of about 30 years, and which have been marked by successive promotions, appears to carry with it serious consequences in respect of superannuation. My Committee feel sure that the Corporation will not desire to deprive Mr. Mitchell of the benefit of his long service, and to sever their association with an official of 30 years' standing, without taking these facts into consideration."

The Dean of Guild (Mr. Charles Ker) moved that action on last Friday's resolution should be suspended, and that a Committee should be appointed to review the evidence at the inquiry, the report, and the manager's statement—with power to engage such expert, professional, or other assistance as might be deemed necessary.

However, the Council refused to suspend the Standing Orders to enable this motion to be discussed, and the three letters were remitted to the Electricity Committee.

Our Glasgow correspondent says the position is still being keenly discussed in municipal circles. There is a proposal to create a technical and a commercial department, with Mr. Mitchell as manager of the former. With regard to an inquiry by experts, the mood of the Corporation at present is strongly against outside interference. It is admitted on all hands, however, that there must be reorganisation, and it is believed that a place will be found for Mr. Mitchell in keeping with his experience and length of service.

The Electrical Review's criticism of the Town Council attracted much attention, and our correspondent heard it frequently referred to. The *Glasgow Herald* thought the Corporation on Thursday had an opportunity of retreating from the unfortunate position in which it placed itself when it called for the resignation of the manager, and said that before it took so drastic a course it ought, in fairness to Mr. Mitchell, to have insisted upon a thorough investigation of those issues which were far from clear after he had replied to the charges made against his administration by the Sub-Committee. Continuing, it says: "It is because the inquiry exposed the failure of the Electricity Committee to discharge the duty it owed to the ratepayers that the public have been rightly incensed at the action of the Corporation in making a scapegoat of the manager of the department, and, by implication, acquitting the Committee of responsibility. And yet it is to this Committee that the Corporation has agreed to refer the letter of the Associated Municipal Electrical Engineers proposing an inquiry by a member of the Institution of Electrical Engineers and a member of the Institute of Chartered Accountants, and also a letter from the National Association of Local Government Officers, which urges that Mr. Mitchell has not had adequate opportunity to safeguard his professional reputation by means of searching and proper investigation." The Glasgow *Evening Citizen*, commenting on the subject, blames the Electricity Committee for bad management, regards Mr. Mitchell as a scapegoat, and says everybody agrees that the Town Council has bungled badly; widespread suspicion has been aroused, and nothing short of a full inquiry will now suffice.

Electric-Sign Advertising.

New York City now has 20,880 electric signs to add to its nocturnal brilliancy in the district reaching from the Battery at the southern end of Manhattan Island up to 135th Street. These figures were obtained from an intensive survey carried out by the New York Edison Company in connection with the Sixth Annual Electric Sign Show which was held recently. The signs represent an aggregate of 1,309,918 lamps. How potent this form of advertising has become in certain localities is shown by the purchase of a hotel in the Times Square District, New York City, to be used for electrical advertising only. The ground floor of this building is occupied by stores, and the first floor—too low to be valuable for sign space—by a beauty parlour, but the rest of the building on two sides is covered with lighted bulletin boards, and there is room on the roof for a large electric sign. The rental of this space is said to bring in a larger income than could possibly be obtained by letting the rooms.

Killing Flies by Electricity!

A German firm has recently taken out a patent in France for a device for killing flies by electricity. According to *L'Electricien*, the device consists of two bare-wire solenoids, the coils of which alternate in such a way that between the adjacent portions of the coils there exists a difference of potential derived from the usual house supply at 110 or 220 volts. Within the case is an electric lamp, the purpose of which is to attract flies and other annoying insects, while below is a trap. The idea is that flies and insects shall be attracted, either by something which appeals to their appetite in the trap, or by the lighted lamp, and that they shall be electrocuted by coming into contact with the solenoid wires, while if this only stuns them they will fall into the pit from which there is no return!

Parliamentary News.

(By Our Special Parliamentary Reporter.)

Factory Inspection.

On February 29th, in the House of Lords, Lord DESBOROUGH, on behalf of the Home Office, informed Lord Astor that the factory inspection establishment in 1913 numbered 222, including nine inspectors at headquarters; it was now 206, including six inspectors at headquarters. The number of factories and workshops visited in 1913 was 406,445; in 1926 it was 300,368. The decrease in the number of visits by inspectors related almost entirely to workshops in which no motive power was used; but in the factories in which power was used, the inspection had not only been maintained but improved. The Home Secretary had decided that an immediate increase in the number of factory inspectors was needed, and two additional inspectors would be appointed as soon as possible. The Factories Bill would be coming on next session, but the Home Secretary had already appointed a committee to go into the whole question of additional inspectors so that no time should be lost.

Television.

On February 28th, in the House of Commons, Mr. MALONE asked the Postmaster-General whether he was taking any steps to keep in touch with recent developments in television; and whether he had considered the application of existing radio legislation to that invention.

Sir W. MITCHELL-THOMSON said that the answer to both parts of the question was in the affirmative. His technical advisers considered that television was still only in the experimental stage.

Radio-Telegraphy Certificates.

On February 28th, Mr. BRIANT asked the Postmaster-General if he would state under what regulation, if any, a natural-born British subject was not eligible for the Post Office certificate of proficiency in radio-telegraphy; and why the fact of being the son of an allied alien debarred him from the occupation of wireless operator on British ships.

Sir W. MITCHELL-THOMSON replied that the International Radiotelegraph Regulations prescribed that a person employed as a wireless operator on a ship must hold a certificate issued by the Government to which the ship was subject. It had been the general rule in this country since 1919 that such a certificate should be issued only to a natural-born British subject whose father was also a natural-born British subject. That rule was made after consultation with all the Government Departments concerned and was considered necessary in view of the special character of the duties.

Proposed New London Tube.

On February 28th, Commander BELLAIRS asked the Minister of Transport whether, with a view to relieving traffic congestion, he would endeavour to obtain consideration, in conjunction with the railway undertakings, of a tube uniting some point or points south of the Thames with Victoria and Paddington by securing facilities in and under Hyde Park, provided that the amenities of the park were duly safeguarded.

Colonel ASHLEY said that, so far as he was aware, no authority was, under present circumstances, prepared to seek powers to carry out a scheme on the lines suggested. There were other tube and railway extensions, such as those recommended in the recent reports on travelling facilities by the London Traffic Advisory Committee, which appeared to be of greater urgency and importance.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1926.

21,860. "Telegraphic receiving apparatus." Creed & Co., Ltd., and F. G. Creed. September 4th, 1926. (285,100.)

25,111. "Aerials and aerial systems for use in wireless telegraphy and telephony." C. S. Franklin and Marconi's Wireless Telegraph Co., Ltd. October 8th, 1926. (Addition to 242,342.) (285,106.)

25,261. "Wireless transmission and reception." J. Robinson. October 11th, 1926. (285,108.)

25,412. "Electrical connectors." J. L. Eve. October 12th, 1926. (285,110.)

27,722. "Frequency-selecting thermionic valves." S. Loewe. November 4th, 1925. (261,013.)

28,019. "Devices for controlling wireless apparatus." R. C. Wood. November 8th, 1926. (285,120.)

28,057. "Selective indicator for the reception of electrical oscillations." Radiofrequenz Ges. November 7th, 1925. (Patent of addition not granted.) (261,041.)

28,138. "Manufacture and production of electrodes, welding-rods and the like for use in arc welding and depositing metal." B. Turner and Ferro-Arc Welding Co., Ltd November 9th, 1926. (285,128.)

28,139. "Manufacture and production of electrodes, welding-rods and the like for use in arc-welding and depositing metal." B. Turner and Ferro-Arc Welding Co., Ltd November 9th, 1926. (285,129.)

28,162. "Portable or semi portable self-contained wireless receiving apparatus." R. L. Howard-Flanders and W. M. Rolph. November 9th, 1926. (Cognate application 6,822/27.) (285,130.)

28,171. "Fine adjusting devices for regulating members." Telefonaktiebolaget L. M. Ericsson. June 1st, 1926. (272,162.)

28,172. "Variable electric rotary condensers." Telefonaktiebolaget L. M. Ericsson. July 22nd, 1926 (274,802.)

28,266. "Oil-break electric switches." A. Reyrolle & Co., Ltd., B. H. Leeson and J. Mirrey. November 10th, 1926. (285,136.)

28,340. "Electric switch plugs." S. D. White and M. Levenger. November 10th, 1926. (285,143.)

28,392. "Jointing of electrical resistance-strip such as used in electric furnaces." H. Wiggin & Co., Ltd., and A. G. Lobley. November 11th, 1926. (285,146.)

28,393. "Electric furnaces." H. Wiggin & Co., Ltd., and A. G. Lobley. November 11th, 1926. (285,147.)

28,413. "Electric couplings." General Electric Co., Ltd., R. J. Kaula and F. G. Quance. November 11th, 1926. (285,148.)

28,421. "Cartons for electric or like bulbs." Britannia Folding Box Co., Ltd., and G. G. Pickard. November 11th, 1926. (285,150.)

28,477. "Means for taking up and paying out flexible electric cables supplying power to moving machines." C. V. A. Eley. November 12th, 1926. (285,155.)

28,535. "Thermionic valve circuits." Igranic Electric Co., Ltd., and P. W. Willans. November 12th, 1926. (Addition to 257,708.) (285,157.)

29,089. "Transmitting and receiving apparatus for directional wireless telegraphy." J. K. Im Thurn, C. E. Horton and J. C. W. Drabble. November 17th, 1926. (285,169.)

29,424. "Electric cooking apparatus." Falkirk Iron Co., Ltd., A. R. Wood and H. J. Kennard. November 22nd, 1926. (285,177.)

29,636. "Electrical distributing and controlling systems." J. F. Perry and Metropolitan-Vickers Electrical Co., Ltd. November 23rd, 1926. (285,182.)

30,010. "Submersible electric heater for the radiators of motor-car engines." H. S. Dickson. August 29th, 1927. (285,185.)

30,638. "Electric protective arrangements." Callender's Cable & Construction Co., Ltd., and C. Kibble White December 3rd, 1926. (285,194.)

31,643. "Electric cigar, cigarette, and like lighters." S. Smith & Sons (Méto- Accessories), Ltd., F. W. Miller and F. Miller. December 14th, 1926. (Cognate application 14,563/27.) (285,200.)

32,379. "Junction boxes for electric cables." Sykes & Dyson, Ltd., P. Sykes, and W. Cooper. December 22nd, 1926. (285,205.)

32,561. "Electric switches." General Electric Co., Ltd., and H. G. Cheel December 23rd, 1926. (285,207.)

32,860. "Electric vaporizer." M. Katzman. December 29th, 1926 (285,210.)

32,936. "Manufacture of the elements for electric batteries." Compagnie Francaise pour l'Exploitation des Procédés Thomson-Houston. July 2nd, 1926. (273,651.)

33,038. "Control gear for winding engines, hoists, and the like." English Electric Co., Ltd., and J. D. Dixon. December 31st, 1926. (285,211.)

1927.

595. "Means for translating electrical variations into light variations." Telefunken Ges. für Drahtlose Telegraphie. January 9th, 1926. (264,176.)

1,538. "Storage-battery cells." D. P. Battery Co., Ltd., J. Waddell, and B. M. Drake. January 18th 1927. (285,226.)

1,714. "Thermionic amplifiers." Igranic Electric Co., Ltd., P. W. Willans and A. D. Hodgson. January 20th, 1927. (285,229.)

2,783. "Electrically operated windscreen wipers for motor vehicles." J. Lucas, Ltd., and E. O. Turner. January 31st, 1927. (285,240.)

3,455. "Tuning device for radio apparatus with coarse and fine tuning." P. H. Lungwitz and A. Fullgrabe & Co. February 7th, 1927. (285,244.)

5,477. "Joint boxes for electric cable joints." Pirelli-General Cable Works, Ltd., and R. E. Horley. February 26th, 1927. (285,256.)

7,257. "Combined electric and magnesium flash-lamp apparatus for photographic purposes." W. Murray. June 18th, 1927. (285,266.)

7,662. "Rheostats." British Thomson Houston Co., Ltd. March 31st, 1926. (268,756.)

7,779. "Sparking plugs." H. Kopf. March 21st, 1927. (285,268.)

10,485. "High-frequency electric signal receiving systems." British Thomson-Houston Co., Ltd. April 19th, 1926. (269,595.)

11,083. "Telephone or like systems." Automatic Telephone Manufacturing Co., Ltd., and F. Tench. November 5th, 1926. (Divided application on 275,343.) (285,279.)

12,355. "Electric storage battery charge indicator." W. R. Penrose. July 7th, 1927. (285,286.)

13,352. "Insulator." T. Bertelsen. May 18th, 1927. (285,290.)

13,929. "Electric accumulators." G. H. Trotter. May 24th, 1927. (285,293.)

16,700. "Couplings for electric conductors." J. W. Hofmann. June 23rd, 1927. (285,303.)

17,300. "Alternating-current relays." General Railway Signal Co. August 31st, 1926. (276,961.)

18,268. "Electrical condensers." R. Bosch Akt.-Ges. August 28th, 1926. (276,635.)

18,305. "Radio receivers and the like." Marconi's Wireless Telegraph Co., Ltd. July 9th, 1926. (274,116.)

18,452. "Electric condensers." Dubilier Condenser Co. (1925), Ltd. (R. H. Cunningham). July 11th, 1927. (285,308.)

19,494. "Electrical pick up and amplifying devices for use with gramophones and the like." H. Andrewes and Dubilier Condenser Co. (1925), Ltd. July 22nd, 1927. (285,315.)

20,667. "Electric switches." British Thomson-Houston Co., Ltd. August 30th, 1926. (276,649.)

20,728. "Loud-speakers." Lu Fong-Chai. October 26th, 1926. (Patent of addition not granted.) (279,795.)

21,597. "Illuminating appliances" Holophane, Ltd. (W. A. Dorey). August 19th, 1927. (285,327.)

22,566. "Signal transmission systems." Wired Radio, Inc. September 20th, 1926. (277,647.)

23,035. "Protection of the lead sheathing of cables." R. Joseph. September 1st 1926. (277,017.)

23,208. "Acoustic devices." Dent & Co. and Johnson, Ltd., C. A. Johnson and A. S. Johnson. September 5th, 1927. (285,330.)

24,979. "Electrically-driven railway vehicles." Schweizerische Lokomotiv- und Maschinenfabrik. October 9th, 1926. (278,690.)

26,828. "Safety arrangements for Röntgen apparatus." W. Otto. October 9th, 1926. (278,757.)

27,087. "Generation of short electric waves." Dr. A. Esau. October 29th, 1926. (275,824.)

28,147. "Identifying marker for insulated conductors." H. Bokelmann and H. Gastrow. November 6th, 1926. (Addition to 266,655.) (280,183.)

28,807. "Method of protecting electric motors." G. Zwicky. November 1st, 1926. (279,594.)

28,864. "Electric motors." A. Baier. November 18th, 1926. (280,888.)

31,960. "Current-collecting trolley for electric vehicles." Maschinenfabrik Oerlikon. November 26th, 1926. (281,330.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from February 29th:—

Eclipse, G. W & Co. (lettering and design). No. 485,657. Class 8. Flash lamp batteries.—Gray, Watt & Co., Ltd., 37, Belmont Street, Aberdeen.

Lincronite. No. 484,053. All goods in Class 8. No. 484,054. Class 13. Metal goods for use in electric lighting, heating, signalling and power installations. No. 480,755, Class 50, and Jacoid, No. 480,368, Class 50. Non-current conducting or insulating parts of switches, cut-outs, fuses and other electrical fittings.—J. A. Crabtree & Co., Ltd.

Magnatone. No. 484,099. Class 8. Combined wireless receiving and gramophone instruments.—Consulting and Radio Service, Ltd., 47, Hope Street, Glasgow.

Parmotor. No. 484,748. Class 8. Electrical relays.—Parmotor Relay Co., 11, Blackfriars Street, Manchester.

Glovox. No. 487,060. All goods in Class 8.—W. T. Glover & Co., Ltd.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

BARNSLEY.—Grammar school extensions (£15,426); Charles Smith, builder.

BEXHILL.—Alterations, Granville Hotel, Sea Road; S. E. Castle.

BIRMINGHAM.—New bank premises for Birmingham Municipal Bank; J. P. Hill, manager, head office, 6-8, Edmund Street.

BLACKBURN.—Junior elementary school, Roe Lee Park; H. M. Webb, borough and water engineer.

BLETCHLEY.—Extensions, Victoria Road, for the Co-operative Society, Ltd.; John Chadwick, architect.

BRADFORD.—Reconstruction of St. James' Public Abattoirs (£150,000); city architect, Town Hall.

BRIGHTON.—Modernising scheme, Sussex Eye Hospital (£10,000), for the governors; E. H. Somers Clarke, hon. secretary.

BURY.—Nurses' hostel, kitchen extensions, &c. (£16,140), at infirmary; John Tinline, Ltd., builders, Bury.

CANTERBURY.—School, Blean, for Kent E.C.; W. H. Robinson, education architect, Sessions House, Maidstone.

CHELMSFORD.—Extensions, with appliances for electrical treatment, Hospital Committee; secretary.

CREWE.—Junior and senior schools, for the Borough E.C.; director of education.

CROYDON.—106 houses, Mitcham Road Estate, and 70 houses, Hermitage Road Estate, for B.C.; C. J. Doyle, contractor, Liverpool. Factory, Brading Road; V. W. Delves-Broughton. (Norbury): Branch library (£11,000); Corporation librarian. (Sanderstead): 48 houses, Farley Road; Richard Costain & Sons.

DERBY.—Church hall (£4,000), St. Aidan's Parish; Rev. J. S. Wilding, vicar.

DUKINFIELD.—Housing scheme (44), Dewsnap Lane; housing surveyor.

DURHAM.—Mental defectives' institution, for the C.C.; T. T. Rees and Richard Holt, architects, Rodney Street, Liverpool.

DUMBARTON.—Smallpox hospital; County Council and Glasgow Corporation.

EDINBURGH.—Extensive additions to Messrs. McVitie and Price's biscuit factory, Robertson Avenue (£24,000); Alister G. Macdonald, architect, London.

FAVERSHAM.—Electric light installation, hospital, for the B.G.; Guy Tassell, clerk.

FENTON (STAFFS.).—Electrical installation, Whist Hall, Fountain Street; A. J. Griffin.

FOLKESTONE.—Housing scheme (74), for the T.C.; A. E. Nichols, borough engineer.

GUILDFORD.—24 houses and 80 flats, Aldershot Road; Herbert Ashenden. Bakery, North Place; Guildford Co-operative Society, Ltd. Electricity supply, brewery; Friary, Holroyd & Healy's Breweries, Ltd. Electricity supply, motor works; Dennis Bros., Ltd. Fire station; Watch Committee.

HANLEY.—Alterations, premises, Lord Street and Etruscan Street; Ind, Coope & Co., Ltd.

HUDDERSFIELD.—Cinema, for Alexandra Pictures (Fartown) Co.; J. Ainley, architect, 55, New Street.

HULL.—Mineral water factory, for R. Hawkshaw, Ltd., Spencer Street; F. Robson, architect, Southam Chambers. Twenty-six houses, Northfield Road; H. Sanderson. Blocks of flats and shops, Scott Street and Caroline Street; city architect. 250 houses, Western Estate (£132,000); H. M.-Nowell, Stockton-on-Tees. Secondary school, Pickering Road; city architect.

INVERNESS-SHIRE.—Alterations to Gorthlick Mansion House, Loch Ness; R. Pert & Son, builders, Montrose.

LEEDS.—Boys' and girls' modern schools (£106,000); extensions to College of Art and Leeds Technical School; director of education.

LEICESTER.—Bus garage extension (£11,200); W. H. and H. G. Riley, architects for Corporation.

LONDON (BECONTREE, E.).—General hospital; King Edward's Hospital Fund for London. Billiard hall, Becontree Avenue; C. J. Thorpe.

(ILFORD, E.).—Greyhound race track, Ilford Lane; Robson and Withington. Additions, Howards' factory, Uphall Road; Howards & Sons, Ltd. Thirty houses, Westminster Gardens; J. Aldridge.

(HENDON, N.).—Two schools, L.C.C. Watling Estate; U.D.C. Education Committee.

LONDON (*continued.*)

(HORNSEY, N.).—Additions, Smithfield Works, Cross Lane; W. H. Partridge.

(Wood Green, N.).—Improvements, Alexandra Palace; Palace trustees and Middlesex county architect.

(CATFORD, S.E.).—Warehouse, Abbotswell Road; J. W. Heath & Sons.

(FOREST HILL, S.E.).—60 houses, Cranston Road Estate; Clout & Tysoe.

(LAMBETH, S.E.).—Dwellings, China Walk area; L.C.C. architect.

(ST. MARYLEBONE, W.).—Extensions, Regent Street Polytechnic (£27,500); Governors and L.C.C.

(BLOOMSBURY, W.C.).—Enlargement, Trade School for Girls (£8,430); L.C.C.

LUTON.—Greyhound racing track, Limbury, for the Luton Greyhound Racing Co., Ltd.

MACCLESFIELD.—Extensions, for the Infirmary Board; A. C. Hanrahan, secretary.

MAIDSTONE.—Grammar school (£41,501); W. H. Robinson, architect, Sessions House; Cox Bros., builders, 22, Lower Stone Street.

NEWTON ABBOT.—90 houses for the U.D.C.; C. D. White, surveyor, Courtenay Street.

NORTON.—School; Education Department, County Hall.

PERTHSHIRE.—Additions to Jordanstone Mansion House, Meigle; Messrs. R. Pert & Son, builders, Montrose.

PLYMOUTH.—Municipal office extensions (£15,000); borough treasurer. Extensions, Science Laboratory, High School for Boys; Pearce Bros.

POYNTON (MACCLESFIELD).—Extensions to silk mill, Tester Road, for E. Stafford.

RENFREWSHIRE.—County sanatorium (£100,000); county clerk, Paisley.

ROCHFORD.—Block for senile dementia patients, for the B.G.; Norman Evans, architect, 41 High Street, Southend-on-Sea.

SEAHAM HARBOUR.—40 houses, Carr House Estate; U.D.C. surveyor. Electrical installation, Council houses; U.D.C. electrical engineer. Electrical installation, Empire Theatre; manager.

SHIPLEY.—Wagon stores, Station Lane; Scientific Roads, Ltd.

SHREWSBURY.—Additional 38 houses, for the T.C.; borough surveyor.

STOCKTON-ON-TEES.—Billiard hall (£5,000); C. W. Cummings, architect, 77, Merrydale Avenue.

STOKE-ON-TRENT.—Electricity supply, Vine Pottery; Birks, Rawlins & Co. Additions, Caloric Works, Vesey Terrace; Messrs. Truswell. Confectionery and butchery departments, Trentham Road; Burslem Co-operative Society, Ltd.

SWANSEA.—Mission hall, Gorse Road; G. S. Knight.

SWINDON (WILTS.).—Additional 100 houses for the T.C.; borough surveyor. New Oxford Hotel (£5,000); Bishop and Fisher, architects.

TORQUAY.—Extensions, Pier concert hall (£1,200); borough engineer. Additions, Hotel Riviera, Park Hill Road; G. C. Ratcliff. Extensions, Abbey Hotel, Abbey Place; J. Whitwell.

TOTTON.—School (£6,250); Hampshire Education Committee.

TYNEMOUTH.—Workshops for Blind for Welfare Society; J. F. Newbold & Co.

UXBRIDGE.—Re-erection of flour mill, for Grimsdale & Son. Extensions, offices, Waterloo Road; Uxbridge Electric Supply Co.

WALSALL.—Infectious diseases hospital (deposit £3 3s.); J. Taylor, borough engineer, Council House.

WELLINGBOROUGH.—Bazaar premises, Market Street, for F. W. Woolworth & Co., Ltd., Kingsway, London.

WESTHAMPNETT.—Sewage works (£22,650); Howard Humphreys & Sons.

WESTON-SUPER-MARE.—Internal automatic telephone installation, with batteries, service wiring, and instruments, and wireless installation, for the Hospital Committee; hon. secretaries, 19, Waterloo Street.

WEYMOUTH.—Buildings on Crescent Street and Queen Street sites; Messrs. Clarke & Cross, Mr. J. C. Mantel and Mr. P. J. A'Court.

WREXHAM.—Additional 100 houses, for the R.D.C.; surveyor.

YORK.—Factory, Bishopsthorpe Road; J. Terry & Sons, Ltd.